IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF SOUTH CAROLINA
CHARLESTON DIVISION

IN RE: AQUEOUS FILM-FORMING FOAMS PRODUCTS LIABILITY LITIGATION	MDL No. 2:18-mn-2873-RMG **This Document Relates to Case No. 20-cv-02115-RMG**

DECLARATION OF ALLAN KANNER

I, ALLAN KANNER, hereby declare as follows:

1. I am an attorney at law of the State of Louisiana, where I am a member in good standing of the bar. I have been admitted before this Court in this action *pro hac vice.* I am counsel for Plaintiffs (the State of New Mexico, *ex rel.* Raul Torrez, Attorney General; James Kenney, in his official capacity as Cabinet Secretary for the New Mexico Environment Department; and Maggie Hart Stebbins, in her official capacity as Natural Resources Trustee) (collectively "Plaintiffs," "New Mexico" or "the State") in connection with the above-captioned matter.

2. I submit the foregoing Declaration in support of Plaintiffs' Motion for Partial Summary Judgment. This Declaration is made upon the basis of personal knowledge.

3. Attached as **Exhibit 1** to this Declaration, and labeled AF09-00001075 through AF09-00001178, is a true and correct copy of excerpts from the Final Site Inspection Report, Cannon Air Force Base, New Mexico, dated August 2018. The complete document was produced in discovery of this matter by the Air Force and authenticated by Air Force personnel (Sheen Kottkamp) in his deposition. The full Final Site Inspection Report is also publicly available in the Air Force Civil Engineer Center's ("AFCEC") administrative record for Cannon, at AR # 1938.[1]

[1] The AFCEC's administrative record for Cannon is available at https://ar.cce.af.mil/. To access a cited document ("AR # ___"), select "Cannon AFB, NM" from "Installation List"

4. Attached as **Exhibit 2** to this Declaration, and labeled FF_AF15-00072186 through FF_AF15-00072408, is a true and correct copy of excerpts from the Final Preliminary Assessment Report for Perfluorinated Compounds at Cannon Air Force Base, New Mexico, dated October 2015. The complete document was produced by the Air Force in discovery and authenticated by Air Force personnel (Sheen Kottkamp and Christopher Gierke) in depositions. The complete Preliminary Assessment Report is also publicly available in the AFCEC's administrative record for Cannon, at AR # 1941.

5. Attached as **Exhibit 3** to this Declaration, and labeled FF_AF15-00041829 through FF_AF15-00041831, is a true and correct copy of an email to the State dated August 14, 2018 and bearing the subject line "PFCs_Cannon AFB_1203 Discharge Notification." The email is from Chris Segura (an Air Force employee) and was received by Dennis McQuillan and Michelle Hunter (both employees of the New Mexico Environment Department ("NMED")). The document was produced by the Air Force in discovery and authenticated by Air Force personnel (Sheen Kottkamp, identified as the "Person in Charge" in the email) in his deposition.

6. Attached as **Exhibit 4** to this Declaration is a true and correct copy of a Letter from the Cannon Air Force Base to the State dated August 30, 2024, informing the State of "the release of PFAS-containing liquid within the Active Fire Training Area and Adjacent Ponding Area" at the Base. It was received by Mr. Gabriel Acevedo and Mr. Robert Murphy, both employees of NMED, and is signed by Colonel Stuart E. Churchill, a commander at Cannon Air Force Base.

7. Attached as **Exhibit 5** to this Declaration is a true and correct copy of the State's verified Supplemental Plaintiff Fact Sheet dated August 8, 2024, prepared in connection with the

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appearing on the left side of the webpage, enter the referenced number in the field denoted "AR #," and click "Search."

above-captioned matter as required by Case Management Orders ("CMO") 5 and 5C. It is signed by Frederic L. Shean (an employee of NMED) and Maggie Hart Stebbins (Natural Resources Trustee for the State of New Mexico). The document was served on the Defendants on August 9, 2024 (via email, in accordance with paragraph 25 of CMO 5), and neither the State nor its counsel have received a Deficiency Letter regarding it (*see* paragraph 12 of CMO 5).

8. Attached as **Exhibit 6** to this Declaration, and labeled NM-AFFF-00000239 through NM-AFFF-00000733, is a true and correct copy of excerpts from NMED's Phase 1 PFAS Investigation Report for Cannon Air Force Base, dated June 30, 2023, and prepared for NMED by Daniel B. Stephens & Associates, Inc. A complete copy of this document was produced by New Mexico in discovery in this matter. The full Phase 1 PFAS Investigation Report is also publicly available at https://www.env.nm.gov/hazardous-waste/cafb/.

9. Attached as **Exhibit 7** to this Declaration, and labeled NM-AFFF-00000734 through NM-AFFF-00000857, is a true and correct copy of excerpts from NMED's Phase 2 PFAS Investigation Report for Cannon Air Force Base, dated June 30, 2023, and prepared for NMED by Daniel B. Stephens & Associates, Inc. A complete copy of this document was produced by New Mexico in discovery in this matter. The full Phase 2 PFAS Investigation Report is also publicly available at https://www.env.nm.gov/hazardous-waste/cafb/.

10. Attached as **Exhibit 8** to this Declaration are true and correct copies of:

a. An invoice in the amount of $17,125.10, dated March 16, 2021, and numbered Invoice No. 0247161. The invoice was submitted to NMED by Daniel B. Stephens & Associates, Inc., for work related to the Phase 1 PFAS Investigation for Cannon Air Force Base (discussed *supra* at ¶ 8), and the Phase 2 PFAS Investigation for Holloman Air Force Base (irrelevant). The invoice is marked "OK

to PAY," and is signed by Patrick Longmire and Chris Catechis, both NMED employees at the time.

b. An NMED Purchase Order numbered 66700-0000036525, in the amount of $921,000. The supplier is identified as Daniel B. Stephens & Associates, Inc. and the Purchase Order is for work relating to the Phase 1 PFAS Investigation for Cannon Air Force Base (discussed *supra* at ¶ 8), and the Phase 2 PFAS Investigation for Holloman Air Force Base (irrelevant).

c. A voucher numbered 00133885, obtained from NMED's financial records, showing that Invoice No. 0247161 was paid in full.

11. Attached as **Exhibit 9** to this Declaration is a true and correct copy of an Interim Report prepared and issued by NMED and the New Mexico Department of Health relating to the State's sampling of private water wells for PFAS contamination, including at or near Cannon Air Force Base. *See* Exhibit 9 at 3. The Report is also publicly available at https://cloud.env.nm.gov/resources/_translator.php/NoP4Wd1EyorPC~sl~BWz~sl~H2+PXdCQEKefUZMa+xAlRrWuxlvdEEjyB6brYbJZSlRiaBFuwykviNKDydp1Rt8rqRZRJzOb5JhKGMK5mfS0Vy6H2jU0XMHZoNdIAi0zhCLXTD.pdf.

12. Attached as **Exhibit 10** to this Declaration is a true and correct copy of a Memorandum of Agreement entered between NMED and the United States Geological Survey ("USGS") regarding a joint effort to collect and analyze samples from water resources in New Mexico in order to characterize the presence and distribution of PFAS therein, including at or near Cannon Air Force Base. *See* Exhibit 10 at 6 (noting sampling events in Curry and Roosevelt Counties, both near Cannon). The work was funded by NMED. *Id.* at 1-2 ("Distribution of Funds"). The Agreement is signed by Jennifer Pruett, Marlene Velasquez, and Jennifer Howler (NMED

employees at the time), and Meghan Roussel (employee of USGS at the time), and is dated August 5, 2020.

13. Attached as **Exhibit 11** to this Declaration are true and correct copies of:

a. An invoice from USGS to NMED regarding work performed under the Memorandum of Agreement (Exhibit 10 to this Declaration, discussed *supra* at ¶ 12), numbered Bill # 90911779, dated July 12, 2021, and in the amount of $235,376.08. The invoice is marked "OK to Pay" by Jill Turner, an NMED employee at the time.

b. A letter dated July 12, 2021, thanking the USGS for its submission of said invoice and approving payment. The letter is signed by Jill Turner, an NMED employee at the time.

14. Attached as **Exhibit 12** to this Declaration are true and correct copies of:

a. An invoice submitted to NMED by Hall Environmental Analysis Laboratory, numbered Invoice # 1811363 and dated November 28, 2018. The invoice notes that the work performed related to "perfluorocarbons" (an older name for PFAS), and is marked as relating to Cannon Air Force Base. The invoice is marked "OK to pay" by Stephanie Stringer, an NMED employee at the time.

b. An NMED Purchase Order numbered 66700-0000032565, in the amount of $20,000. The supplier is identified as Hall Environmental Analysis Laboratory, and the Purchase Order is for "[p]rocessing [w]ater samples, including [p]erfluorinated compound analysis" (relating to the above-described invoice).

15. Attached as **Exhibit 13** to this Declaration, and labeled NM-AFFF-00000858 through NM-AFFF-00000893, is a true and correct copy of excerpts from the Depopulation and

Removal Plan for Highland Dairy Cow Herd submitted to the State by Mr. and Mrs. Art Schaap (as general partners of Highland Dairy). The Plan is dated April 19, 2022, and is approved via the signature of James Kenney, Cabinet Secretary for NMED, dated May 12, 2022. A complete copy of this document was produced by New Mexico in discovery in this matter, and it is publicly available at https://www.env.nm.gov/pfas/wp-content/uploads/sites/25/2022/05/2022-05-12-Highland-Dairy-Depop-Removal-Plan-and-App-Narrative-Final.pdf.

16. Attached as **Exhibit 14** to this Declaration is a true and correct copy of the Application for Funding from the New Mexico Hazardous Waste Emergency Fund for Art and Renee Schaap, d/b/a Highland Dairy (Curry County, New Mexico). The document is dated May 12, 2022, signed by John B. Kern (an authorized representative of Highland Dairy), and was submitted to Bruce Baizel, Esq. and Chris Catechis (both NMED employees at the time). The Application seeks funding from the State for costs associated with "establishing compost facilities, the depopulation [*i.e.* euthanasia] of the remaining members of [Highland Dairy's] herd, and the composting activities themselves," as described in more detail in the Depopulation and Removal Plan for Highland Dairy (Exhibit 13 to this Declaration, *see supra* at paragraph 15).

17. Attached as **Exhibit 15** to this Declaration is a true and correct copy of a memorandum titled Request for Release of Hazardous Waste Emergency Funds to Provide Emergency Response for Removal and Disposal of PFAS Contaminated Livestock, dated May 2, 2022. The memorandum was prepared by Chris Catechis, an NMED employee at the time, and was submitted to James Kenney, Cabinet Secretary for NMED. The memorandum notes that "[c]ontamination of the dairy herd resulted from groundwater used by Highland Dairy that was polluted by the U.S. Air Force" and that "[i]mproper handling and disposal of mortalities of the Highland Dairy herd could result in new or expanded PFAS-contaminated groundwater in the

Clovis area." The memorandum's request for releasing $850,000 from the State's Hazardous Waste Emergency Funds is approved via Secretary Kenney's signature, appearing at the bottom of the document and dated May 4, 2022.

18. Attached as **Exhibit 16** to this Declaration are true and correct copies of:

a. An invoice submitted to NMED by Highland Dairy, numbered Invoice No. 22-NMED-01, dated June 30, 2022, and in the amount of $850,000. The invoice describes in detail the activities for which the payment is requested, references Highland Dairy's Application for Funding (Exhibit 14 to this Declaration, discussed *supra* at paragraph 16), and is marked "OK to Pay" and signed by Chris Catechis, an NMED employee at the time.

b. A voucher numbered 00142476, obtained from NMED's financial records, showing that Invoice 22-NMED-01 was paid in full.

19. Attached as **Exhibit 17** to this Declaration, and labeled FF_AF15-00022778 through FF_AF15-00022779, is a true and correct copy of a letter dated September 26, 2018, commenting on and conditionally approving the Air Force's Site Investigation Report (concerning the presence of PFAS in groundwater and soils at Cannon Air Force Base). The letter is addressed to Chris Segura (an Air Force employee at the time), and is signed by Michelle Huner (an NMED employee at the time). The document was produced by the Air Force in discovery of this matter.

20. Attached as **Exhibit 18** to this Declaration, and labeled FF_AF31-00006699 through FF_AF31-00006713, is a true and correct copy of a letter dated December 15, 2021, commenting on and disapproving the Air Force's Draft Aqueous Film-Forming Foam Release Areas Phase I Remedial Investigation Work Plan (concerning the Air Force's planned actions to fully characterize PFAS contamination at and around Cannon Air Force Base). The letter is

addressed to Chris Segura (an Air Force employee at the time) and is signed by Rick Shean (an NMED employee at the time). The document was produced by the Air Force in discovery of this matter.

21. Attached as **Exhibit 19** to this Declaration, and labeled FF_AF31-00006870 through FF_AF31-00006872, is a true and correct copy of a letter dated June 4, 2019/ The letter is addressed to Colonel Stewart Hammons (commander of Canon Air Force Base at the time), and is signed by John Kieling (an NMED employee at the time). In the letter, NMED requests additional information regarding releases of PFAS into the environment at Cannon Air Force Base. The document was produced by the Air Force in discovery of this matter.

22. Attached as **Exhibit 20** to this Declaration is a true and correct copy of a news release published by NMED, dated August 20, 2024. It is titled "State offers free blood tests for PFAS chemicals near Cannon [Air Force Base]," and describes the availability and nature of free PFAS blood tests for anyone who lived or worked in certain areas near Cannon Air Force Base, along with public meetings held to discuss such efforts with the community. The document is publicly available at https://www.env.nm.gov/state-offers-free-blood-tests-for-pfas-chemicals-near-cannon-afb/.

23. Attached as **Exhibit 21** to this Declaration is a true and correct copy a Professional Services Contract entered into by NMED and Eastern Research Group, Inc., dated October 28, 2024. Attachment A to the contract describes the scope of work: "to conduct [PFAS] public health surveillance through blood sampling clinics/events . . . using systematic scientific collection and analysis methods to identify up to 33 different PFAS commonly found in firefighting foams and consumer goods helping individuals understand their exposure levels and guiding healthcare providers on managing potential health risks." The document is signed by Danielle Gilliam, Gloria

Lucero, Miranda Ntoko (all NMED employees at the time), and John Wilhelmi (Vice President of Easter Research Group, Inc. at the time).

24. Attached as **Exhibit 22** to this Declaration is true and correct copy of an NMED Purchase Order numbered 66700-0000044124, in the amount of $373,403. The supplier is identified as Eastern Research Group, Inc., and the Purchase Order is for "[l]ab testing due to a critical public health intervention related to public exposure to [PFAS] near Cannon Air Force Base" that was performed under the Professional Service Contract discussed above (Exhibit 21 to this Declaration, *see supra* at paragraph 23).

25. Attached as **Exhibit 23** to this Declaration are true and correct copies of:

a. An invoice from Abt Associates Inc. numbered 30150-T09-10, issued to Plaintiff the New Mexico Office of Natural Resources Trustee ("ONRT"). The invoice is dated July 12, 2024, is in the amount of $415.92, and is signed by Stefanie Umbarger of Abt Associates Inc. In the attached "Monthly Progress Report," Abt Associates Inc. identifies work performed during the applicable period (October 6, 2022 through December 30, 2022), all relating to preparation of a Preassessment Screen ("PAS") for Cannon Air Force Base.

b. An email from Mercy Abute to Kate Girard, both employees of ONRT, showing that Invoice 30150-T09-10 has been paid.

26. Attached as **Exhibit 24** to this Declaration is a true and correct copy of excerpts from the Preassessment Screen Determination for Cannon Air Force Base. It is dated December 12, 2024, and was prepared by Abt Associates, Inc. for ONRT. The document was prepared in accordance with 43 C.F.R. §§ 11.23-.25, and was shared with the Air Force in accordance with 43 C.F.R. §§ 11.32(a)(1)(i) (notice for other natural resource trustees) and 11.32(a)(2)(iii)(A) (notice

for potentially responsible parties).

Signed under the penalties of perjury this 25th day of June, 2025.

/s/ Allan Kanner
Allan Kanner

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that on June 25, 2025, I electronically filed the foregoing document with the Clerk of the Court using CM/ECF. I also certify the foregoing document is being served this day on all counsel of record in this case via transmission of Notice of Electronic Filing generated by CM/ECF.

/s/ Allan Kanner
Allan Kanner

Exhibit 1

FINAL

SITE INSPECTION REPORT

CANNON AIR FORCE BASE, NM

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide

Contract FA8903-16-D-0027
Task Order 0004

Prepared for:
Air Force Civil Engineer Center
JBSA Lackland, Texas

August 2018

Submitted by:
amec foster wheeler

EXECUTIVE SUMMARY

This Site Inspection (SI) Report (SIR) was prepared by Amec Foster Wheeler Programs, Inc., together with affiliate Wood Environment & Infrastructure Solutions, Inc. (formerly known as Amec Foster Wheeler Environment & Infrastructure, Inc.)[1], collectively referred to as Amec Foster Wheeler, under Contract No. FA8903-16-D-0027, Task Order 0004, to document the results of SI activities conducted at 14 aqueous film forming foam (AFFF) release areas located at Cannon Air Force Base (AFB). The purpose of the SI was to determine, through environmental media sampling, if a release of per- and polyfluorinated alkyl substances (PFAS) has occurred at potential AFFF release areas identified during a Preliminary Assessment (PA) conducted by HydroGeoLogic, Inc. (HGL) (2015), or identified during the installation scoping visit conducted by Amec Foster Wheeler on 24 and 25 October 2016.

The data presented in this SIR were collected and evaluated in accordance with the Final Installation-Specific Work Plan (ISWP) (Amec Foster Wheeler, 2017a) and the General Quality Program Plan (QPP) (Amec Foster Wheeler, 2017b).

PFAS are a class of synthetic organofluorine compounds that possess a chemical structure that gives them unique properties, including thermal stability and the ability to repel both water and oil. These chemical properties make them useful components in a wide variety of consumer and industrial products, including non-stick cookware, food packaging, waterproof clothing, fabric stain protectors, lubricants, paints, and firefighting foams such as AFFF. AFFF concentrate contains fluorocarbon surfactants to meet required performance standards for fire extinguishing agents (Department of Defense [DoD] Military Specification MIL-F-24385F [SH], Amendment 1, 5 August 1984). The United States Air Force (USAF) began purchasing and using AFFF containing PFAS (perfluorooctanesulfonic acid [PFOS] and/or perfluorooctanoic acid [PFOA]) for extinguishing petroleum fires and during firefighting training activities in 1970. AFFF was primarily used on USAF installations at fire training areas (FTAs), but may have also been used, stored or released from hangar fire suppression systems, at firefighting equipment testing and maintenance areas, and during emergency response actions for fuel spills and/or aircraft mishaps.

The United States Environmental Protection Agency (USEPA) Office of Water issued lifetime drinking water Health Advisory (HA) values for PFOS and PFOA in May 2016 that replaced the 2009 Provisional HA values. The HA values for PFOS and PFOA are 0.07 micrograms per liter (µg/L) for each constituent; however, when these two chemicals co-occur in a drinking water source, a conservative and health-protective approach is recommended that compares the sum of the concentrations (PFOS + PFOA) to the HA value (0.07 µg/L). HA values are not to be construed as legally enforceable federal standards and are subject to change as new information becomes available (USEPA, 2016a and 2016b). Although the USEPA

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[1] Amec Foster Wheeler Environment & Infrastructure, Inc. changed its name on 6 April 2018 to Wood Environment & Infrastructure Solutions, Inc., to reflect Wood Group's acquisition of Amec Foster Wheeler. All resource documents created, and activities conducted under Amec Foster Wheeler Environment & Infrastructure, Inc. remain in place, will be referred to Amec Foster Wheeler, and are executed under Wood Environment & Infrastructure Solutions, Inc.

has not established HA values for PFAS in soil, the USAF calculated a residential screening level of 1.26 milligrams per kilogram (mg/kg) for PFOS and PFOA in soil, based on a total hazard quotient (THQ) of 1.0, using the USEPA Regional Screening Level (RSL) calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search). This screening value was presented in the Final ISWP (Amec Foster Wheeler, 2017a); however, in March 2018, the USAF issued revised guidance, *PFAS Site Inspection Objectives and Follow-On Activities*, whereby a new residential screening level for soil and sediment of 0.126 mg/kg was calculated based on a THQ of 0.1 (USAF, 2018).

While PFOS and PFOA in groundwater are the focus of the HA, USEPA has also derived Tap Water RSL values for perfluorobutanesulfonic acid (PFBS) for which there is a Tier 2 toxicity value (Provisional Peer Review Toxicity Value) (USEPA, 2017a). Based on the Final ISWP (Amec Foster Wheeler, 2017a), concentrations of PFBS detected in groundwater and soil were to be compared to the Tap Water RSL of 400 µg/L and residential soil RSL of 1,300 mg/kg, respectively. However, as per the USAF revised guidance issued subsequent to the ISWP, revised RSLs for PFBS of 130 mg/kg in soil and 40 µg/L in groundwater were calculated based on a THQ of 0.1 and will be used for comparison in this SIR (USAF, 2018).

Neither the USEPA nor New Mexico Environment Department (NMED) have issued HA values or promulgated standards for any other PFAS constituents to date.

Cannon AFB is located in eastern New Mexico, approximately 7 miles southwest of the City of Clovis, in Curry County, New Mexico. The installation encompasses approximately 3,789 acres and is comprised of two perpendicular active runways in the central and southwestern portions; maintenance, support, and operational facilities west of the central runway/flightline; supplemental hangars and apron areas in the south-central region; a wastewater treatment plant (WWTP) to the east; and, a golf course and residential and service facilities in the northwestern portion (HGL, 2015).

Cannon AFB is currently home of the 27th Special Operation Wing (SOW), which was activated in 2006 under the control of the Air Force Special Operations Command (AFSOC). The 27th SOW supports the USAF in conducting sensitive special operations missions including close air support, unmanned aerial vehicle operations, and non-standard aviation in response to the Secretary of Defense (Versar, 2013).

The PA provided findings from research conducted to determine whether and where AFFF, containing PFAS, was stored, handled, used or released at Cannon AFB. Based on the research conducted during the PA, as well as the information collected during an installation scoping visit conducted by Amec Foster Wheeler on 24 and 25 October 2016, the following 14 AFFF release areas were recommended for SI:

- AFFF Release Area 1: Former FTA No. 2
- AFFF Release Area 2: Former FTA No. 3
- AFFF Release Area 3: Former FTA No. 4
- AFFF Release Area 4: Hangars 119 and 133
- AFFF Release Area 5: Former Sewage Lagoons
- AFFF Release Area 6: North Playa Lake Outfall
- AFFF Release Area 7: South Playa Lake Outfall

- AFFF Release Area 8: Whispering Winds Golf Course Outfall
- AFFF Release Area 9: Hangar 109
- AFFF Release Area 10: Landfill #4
- AFFF Release Area 11: Active FTA
- AFFF Release Area 12: Perimeter Road Fuel Spill
- AFFF Release Area 13: Former Crash Sites
- AFFF Release Area 14: Basewide Groundwater

The specific objectives of the SI were as follows:

- Determine if PFAS are present in soil, sediment, groundwater or surface water at AFFF release areas selected for SI;
- Determine if PFOS and PFOA concentrations in soil or sediment exceed the calculated RSL, based on a residential exposure scenario, of 0.126 mg/kg, and PFBS concentrations exceed the USEPA residential RSL of 130 mg/kg;
- Determine if concentrations of PFOS, PFOA, or the sum of PFOS and PFOA, in groundwater and surface water exceed the USEPA HA value of 0.07 µg /L, and if PFBS concentrations exceed the USEPA Tap Water RSL of 40 µg/L; and,
- Identify potential receptor pathways with immediate impacts to human health (immediate impact to human health is considered consumption of drinking water with PFOS/PFOA above the USEPA HA value, or PFBS above the USEPA Tap Water RSL).

PFAS Analytical Results

PFOS in surface soil was detected above the calculated RSL in AFFF release areas 2, 3, 4, 5, 9, and 11. PFOS in subsurface soil was detected above the calculated RSL in AFFF Release Area 5. PFOA, and PFBS were below the calculated RSLs, based on a residential scenario, at all AFFF release areas.

PFOS, PFOA, and/or PFOS+PFOA were detected in groundwater at concentrations exceeding the HA values in six monitoring wells sampled relative to AFFF Release Area 14. PFBS was detected in groundwater at concentrations below the Tap Water RSL in 11 of the 18 monitoring wells sampled.

PFOS was detected in sediment at AFFF release areas 6 and 8, but the detections were below the calculated RSL. PFOA and PFBS were not detected in sediment.

PFOS, PFOA, and/or PFOS+PFOA were sampled for, and detected in surface water at AFFF Release Areas 6 and 8; the detections exceeded the HA values at AFFF Release Area 6 and were below HA values at AFFF Release Area 8.

Surface and Subsurface Soil Receptors

Potentially complete soil exposure pathways exist at AFFF release areas 2, 3, 4, 5, 9, and 11. Potential human exposure receptors from PFOS and PFOA in surface and subsurface soil include USAF personnel, contract personnel, grounds maintenance workers, utility workers, construction workers, and visitors. Surface soil is a possible exposure point for on-site workers and site visitors, at AFFF release areas 2, 3, 4,

5, 9, and 11 and subsurface soil is a possible exposure point primarily for on-site workers involved in excavation, digging, and other activities that expose soil below ground surface at AFFF Release Area 5. The highest potential for exposure to PFOS and PFOA from soil is to on-site workers that may be involved with excavation or drilling activities. Based on the SI, potential complete pathways for human exposure to PFAS-impacted surface and subsurface soil were identified.

Groundwater Receptors

Potential human exposure receptors of PFAS in groundwater, via the ingestion pathway, include residents of properties downgradient of identified groundwater release areas that currently obtain drinking water from private (domestic or domestic and livestock) water supply wells. As a result, there is currently a potential receptor pathway with immediate impacts to human health at Cannon AFB.

Sediment Receptors

PFOS was detected in sediments collected at AFFF release areas 6 and 8 at concentrations below the calculated RSL. Potential exposure receptors include USAF personnel, contract personnel, grounds maintenance workers, utility workers, construction workers, and visitors that may come into contact with sediment at these AFFF release areas.

Surface Water Receptors

PFOS and/or PFOS+PFOA were detected/calculated in surface water at concentrations exceeding USEPA HA value of 0.07 µg/L at AFFF Release Area 6, and below the USEPA HA at AFFF Release Area 8. Potential exposure receptors include USAF personnel and residents, grounds maintenance workers, utility workers, construction workers, and site visitors that may come in contact with surface water at AFFF Release Areas 6 and 8.

1.0 INTRODUCTION

This Site Inspection (SI) Report (SIR) was prepared by Amec Foster Wheeler Programs, Inc., together with affiliate Wood Environment & Infrastructure Solutions, Inc. (formerly known as Amec Foster Wheeler Environment & Infrastructure, Inc.)[2], collectively referred to as Amec Foster Wheeler, under Contract No. FA8903-16-D-0027, Task Order 0004, to document the results of SI activities conducted at 14 aqueous film forming foam (AFFF) release areas located at Cannon Air Force Base (AFB). The purpose of the SI was to determine, through environmental media sampling, if a release of per- and polyfluorinated alkyl substances (PFAS) has occurred at potential AFFF release areas identified during a Preliminary Assessment (PA) conducted by HydroGeologic Inc. (HGL) (2015), or during the installation scoping visit conducted by Amec Foster Wheeler on 24 and 25 October 2016.

The data presented in this SIR were collected and evaluated in accordance with the Final Installation-Specific Work Plan (ISWP) (Amec Foster Wheeler, 2017a) and the General Quality Program Plan (QPP) (Amec Foster Wheeler, 2017b).

1.1 PER- AND POLY-FLUORINATED ALKYL SUBSTANCES OVERVIEW

PFAS are a class of synthetic organofluorine compounds that possess a chemical structure that gives them unique properties, including thermal stability and the ability to repel both water and oil. These chemical properties make them useful components in a wide variety of consumer and industrial products, including non-stick cookware, food packaging, waterproof clothing, fabric stain protectors, lubricants, paints, and firefighting foams such as AFFF. AFFF concentrate contains fluorocarbon surfactants to meet required performance standards for fire extinguishing agents (Department of Defense [DoD] Military Specification MIL-F-24385F [SH], Amendment 1, 5 August 1984). The United States Air Force (USAF) began purchasing and using AFFF containing PFAS (perfluorooctanesulfonic acid [PFOS] and/or perfluorooctanoic acid [PFOA]) for extinguishing petroleum fires and during firefighting training activities in 1970, as confirmed by the following federal government documents:

- Military Specification for AFFF (MIL-F-24385), formally issued in 1969;
- General Accounting Office determination on sole source award protest to provide AFFF to the Navy in December 1969; and,
- *A History of USAF Fire Protection Training at Chanute Air Force Base*, 1964-1976 (Coates, 1977).

AFFF was primarily used on USAF installations at fire training areas (FTAs), but may have also been used, stored or released from hangar fire suppression systems, at firefighting equipment testing and maintenance areas, and during emergency response actions for fuel spills and/or aircraft mishaps.

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[2] Amec Foster Wheeler Environment & Infrastructure, Inc. changed its name on 6 April 2018 to Wood Environment & Infrastructure Solutions, Inc., to reflect Wood Group's acquisition of Amec Foster Wheeler. All resource documents created, and activities conducted under Amec Foster Wheeler Environment & Infrastructure, Inc. remain in place, will be referred to Amec Foster Wheeler, and are executed under Wood Environment & Infrastructure Solutions, Inc.

2.0 AFFF RELEASE AREA BACKGROUND

2.1 SITE LOCATION AND SETTING

Cannon AFB is located in eastern New Mexico, approximately 7 miles southwest of the city of Clovis, in Curry County, New Mexico. The installation encompasses approximately 3,789 acres and is comprised of two perpendicular active runways in the central and southwestern portions; maintenance, support, and operational facilities west of the central runway/flightline; supplemental hangars and apron areas in the south-central region; a wastewater treatment plant (WWTP) to the east; and, a golf course, residential and service facilities in the northwestern portion (HGL, 2015).

2.2 SITE HISTORY

Cannon AFB dates to 1929 when Portair Field was established as a civilian passenger terminal. The Army Air Corps took control of the civilian airfield in 1942, and it became known as the Clovis Army Air Base. The installation was renamed Clovis Army Air Field in early 1945, where flying, bombing, and gunnery classes continued until the installation was deactivated in May 1947. The installation was reassigned to the Tactical Air Command (TAC) and formally reactivated as Clovis AFB in 1951. The installation became permanent in June 1957 and was renamed Cannon AFB in honor of the late General John K. Cannon, a former commander of the TAC. The 312th Tactical Fighter Wing (TFW) was deactivated in 1959 and replaced at Cannon by the 27th TFW. The installation mission changed in 1965 to that of a replacement training unit (Versar, 2013).

The Secretary of Defense recommended the closure of Cannon AFB to the Base Realignment and Closure (BRAC) Commission in May 2005. The BRAC Commission recommended that the installation remain open until the end of 2009 or until a new mission was found. The 27th Special Operation Wing (SOW) was activated at Cannon AFB in 2006 under the control of the Air Force Special Operations Command (AFSOC). The 27th SOW continues to be the host unit at Cannon AFB, supporting the USAF in conducting sensitive special operations missions including close air support, unmanned aerial vehicle operations, non-standard aviation in response to the Secretary of Defense (Versar, 2013).

2.3 PREVIOUS INVESTIGATIONS

HGL conducted a PA of FTA and non-FTA sites at Cannon AFB to determine locations of potential environmental releases of PFAS from AFFF storage or usage areas (HGL, 2015). Twenty-one potential AFFF release areas were identified during the PA research. However, the following 10 AFFF areas were recommended for SI (**Figure 2.3-1**):

- Former FTA No. 2 (Installation Restoration Program [IRP] Site ID FT-07 and Solid Waste Management Unit [SWMU] No. 106 [SWMU-106]): Former FTA No. 2 is located in the southeast corner of the installation, approximately 1,000 feet south of the active FTA, and was used for fire training exercises from approximately 1968 to 1974. The area consisted of two round depressions in the land surface, each measuring approximately 100 feet in diameter. Fire training exercises were conducted twice per quarter using approximately 300-gallons of unused jet propellant (JP)-

A detailed description of sampling locations and results at each AFFF release area is provided in the following sections.

3.1 AFFF RELEASE AREA 1: FORMER FTA NO. 2

Former FTA No. 2 is located in the southeast corner of the installation, approximately 1,000 feet south of the active FTA, and was used for fire training exercises from approximately 1968 to 1974. The area consisted of two round depressions in the land surface, each measuring approximately 100 feet in diameter. Fire training exercises were conducted twice per quarter using approximately 300-gallons of unused JP-4. No specific AFFF use was reported at former FTA No. 2; however, since the FTA operated after initial use of AFFF at the installation, it is likely that AFFF was used at this location.

3.1.1 Soil Sample Locations and Methodologies

Two soil borings (SB01001 and SB01002) were advanced at Former FTA No. 2 on 19 November 2017. One soil boring (SB01001) was completed at the approximate center of the west burn pit and the second soil boring (SB01002) was completed at the approximate center of the east burn pit, at locations where AFFF may have been released (**Figure 3.1-1**). Surface soil samples were collected from 0 to 0.5-feet bgs, and subsurface soil samples were collected at depths ranging from 28 to 30 feet bgs, at both boring locations. Samples were collected for PFAS analysis.

Two composite soil samples were also collected with soil from each boring; the first composite sample consisted of soil from the 0 to 0.5 feet bgs sampling interval and the second composite sample consisted of soil from the 28 to 30 feet bgs sampling interval. Composite samples were analyzed for TOC, pH, and particle size analysis.

3.1.2 Soil Analytical Results

Two surface soil samples and two subsurface soil samples were collected from borings SB01001 and SB01002 on 19 November 2017. PFAS results are provided in **Table 3.1-1**, illustrated on **Figure 3.1-2**, and are summarized below.

SB01001:

- PFOS was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.049 mg/kg and in the subsurface soil sample (28 to 30 feet bgs) at a concentration of 0.0053 mg/kg.
- PFOA was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.0013 mg/kg and in the subsurface soil sample (28 to 30 feet bgs) at a concentration of 0.035 mg/kg.
- PFBS was not detected in either the surface or subsurface soil sample.

SB01002:

- PFOS was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.045 mg/kg, and was not detected in the subsurface soil sample (28 to 30 feet bgs).

- PFOA was not detected in the surface soil sample (0 to 0.5 feet bgs) but was detected below the RSL in the subsurface soil sample (28 to 30 feet bgs) at an approximate concentration of 0.00075 mg/kg.
- PFBS was not detected in either the surface or subsurface soil sample.

Physiochemical properties analysis of composite samples indicated TOC concentrations of 15,600 mg/kg in the surface soil (0 to 0.5 feet bgs) and 1,950 mg/kg in the subsurface soil (28 to 30 feet bgs); and, pH of 7.71 Standard Unit (S.U.) in the surface soil (0 to 0.5 feet bgs) and 8.36 S.U. in the subsurface soil (28 to 30 feet bgs). Physiochemical properties analytical test results are presented in **Table 3.1-2**.

The particle size analytical results for the surface soil sample was 49.9% fines (silt and clay), and 50.1% sand (fine to coarse); and, the subsurface soil sample was 36.6% fines (silt and clay), 62.0% sand (fine to coarse), and 1.4% gravel (fine). The material description for the 0 to 0.5 feet bgs sample was a red to dark red, sandy silt to silty sand, while the 28 to 30 feet bgs sample was described as yellowish-red to pink silty fine sand.

3.1.3 Conclusions

PFOS and PFOA were detected in soil at AFFF Release Area 1 at concentrations below the calculated RSL. The highest concentrations of PFAS constituents were identified in surface soils at SB01001, located within the former burn pit where AFFF may have been released.

3.2 AFFF RELEASE AREA 2: FORMER FTA NO. 3

Former FTA No. 3 is located in the southeast corner of the installation, approximately 800 feet southeast of the active FTA, and was used concurrently with FTA No. 2 between approximately 1968 and 1974. Training exercises were conducted twice per quarter in an unlined, half-moon shaped area, approximately 100 feet in length. No specific use of AFFF at former FTA No. 3 was recorded; however, since the FTA operated after initial use of AFFF at the installation (1970), it is likely that AFFF was used.

3.2.1 Soil Sample Locations and Methodologies

Two soil borings (SB02001 and SB02002) were advanced within the former FTA area on 14 November 2017. One soil boring (SB02001) was located in the west central portion of the FTA at a location where AFFF may have been released during training exercises. The second soil boring (SB02002) was located topographically down-slope from SB02001 where released AFFF may have accumulated (**Figure 3.2-1**). Surface soil samples were collected in each boring from 0 to 0.5-feet bgs, and subsurface soil samples were collected at depths ranging from 28 to 30 feet bgs. Samples were collected for PFAS analysis.

Two composite soil samples were also collected with soil from each boring; the first composite sample consisted of soil from the 0 to 0.5 feet bgs sampling interval and the second composite sample consisted of soil from the 28 to 30 feet bgs sampling interval. Composite samples were analyzed for TOC, pH, and particle size analysis.

3.2.2 Soil Analytical Results

Three surface soil samples (two normal and one field duplicate) and two subsurface soil samples were collected from soil borings SB02001 and SB02002 on 14 November 2017. PFAS results are provided in **Table 3.1-1**, illustrated in **Figure 3.2-2**, and are summarized below.

SB02001:

- PFOS was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.12 mg/kg. PFOS was not detected in the subsurface soil sample.
- PFOA was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a maximum concentration of 0.0032 mg/kg (detected in the duplicate sample). PFOA was not detected in the subsurface soil sample.
- PFBS was not detected at either interval.

SB02002:

- PFOS was detected above the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.24 mg/kg. PFOS was not detected in the subsurface soil sample.
- PFOA was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.0017 mg/kg. PFOA was not detected in the subsurface soil sample.
- PFBS was not detected at either interval.

Physiochemical properties analysis of composite samples indicated TOC concentrations of 14,700 mg/kg in the surface soil (0 to 0.5 feet bgs) and 4,530 mg/kg in the subsurface soil (28 to 30 feet bgs); and, pH of 8.25 S.U. in the surface soil (0 to 0.5 feet bgs) and 8.33 S.U. in the subsurface soil (28 to 30 feet bgs). Physiochemical properties analytical test results are presented in **Table 3.1-2**.

The particle size analytical results for the 0 to 0.5 feet bgs sample was 29.0% fines (silt and clay), 58.0% sand (fine to coarse), and 13.0% gravel (fine), while the 28 to 30 feet bgs sample was 32.0% fines (silt and clay), 65.1% sand (fine to coarse), and 2.9% gravel (fine). The material description for the 0 to 0.5 feet bgs sample was a reddish-brown clayey sand, while the 28 to 30 feet bgs sample was described as a pinkish white silty sand.

3.2.3 Conclusions

PFOS was detected in soil at concentrations above the calculated RSL at AFFF Release Area 2. PFOA was detected in soil, but at concentrations below the calculated RSLs and PFBS was not detected in soil at AFFF Release Area 2.

3.3 AFFF RELEASE AREA 3: FORMER FTA NO. 4

Former FTA No. 4 was used from 1974 through approximately 1995 for fire training exercises. Training activities were conducted twice per quarter, during which an unknown volume of AFFF was used. FTA No. 4 consisted of an unlined circular area approximately 400 feet in diameter with a mock aircraft located in the center. Prior to 1985, JP-4 and AFFF runoff generated during fire training exercises collected in an

unlined pit. The pit was backfilled in 1985 and a new, lined pit with an OWS was installed to handle collected runoff.

3.3.1 Soil Sample Locations and Methodologies

Three soil borings (SB03001, SB03002, and SB03003) were advanced at AFFF Release Area 3 on 15 November 2017 (**Figure 3.3-1**). One soil boring was completed at the location of the former mock aircraft burn area (SB03001); one soil boring was completed at the location of the former unlined discharge pit/OWS location (SB03002); and one soil boring was completed in the northwest portion of the FTA in the location where fire training was conducted on vehicle chassis (SB03003). Surface soil samples were collected from 0 to 0.5 feet bgs and subsurface soil samples were collected between 23 and 50 feet bgs. Samples were collected for PFAS analysis.

Two composite soil samples were also collected with soil from each boring; the first composite sample consisted of soil from the 0 to 0.5 feet bgs sampling interval and the second composite sample consisted of soil from the 48 to 50 feet bgs sampling interval. Composite samples were analyzed for TOC, pH, and particle size analysis.

3.3.2 Soil Analytical Results

Three surface soil samples and four subsurface soil samples were collected from borings SB03001, SB03002 and SB03003 on 15 November 2017. PFAS results are provided in **Table 3.1-1**, illustrated on **Figure 3.3-2**, and are summarized below.

SB03001:

- PFOS was detected above the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.61 mg/kg. PFOS was not detected in either the subsurface sample collected between 23 and 24 feet bgs or the sample collected between 40 and 41 feet bgs.
- PFOA was detected below the RSL in the surface soil at an approximate concentration of 0.006 mg/kg. PFOA was also detected below the RSL in the subsurface samples with a maximum concentration of 0.064 mg/kg detected in the sample collected between 40 and 41 feet bgs.
- PFBS was not detected in the surface soil sample. PFBS was detected below the RSL in subsurface soil at a maximum concentration of 0.039 mg/kg between 23 and 24 feet bgs.

SB03002:

- PFOS was detected above the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.17 mg/kg. PFOS was not detected in the subsurface sample collected between 48 and 50 feet bgs.
- PFOA was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.0015 mg/kg. PFOA was not detected in the subsurface sample collected between 48 and 50 feet bgs.
- PFBS was not detected at either sample interval.

SB03003:

- PFOS was detected above the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.32 mg/kg. PFOS was not detected in the subsurface sample collected between 48 and 50 feet bgs.
- PFOA was not detected at either sample interval.
- PFBS was not detected in the surface soil sample. PFBS was detected below the RSL in the subsurface sample collected between 48 and 50 feet bgs at an approximate concentration of 0.0022 mg/kg.

Physiochemical properties analysis of composite samples indicated TOC concentrations of 3,810 mg/kg in the surface soil (0 to 0.5 feet bgs) and 332 mg/kg in the subsurface soil (48 to 50 feet bgs); and, pH of 8.58 S.U. in the surface soil (0 to 0.5 feet bgs) and 8.13 S.U. in the subsurface soil (48 to 50 feet bgs). Physiochemical properties analytical test results are presented in **Table 3.1-2**.

The particle size analytical results for the 0 to 0.5 feet bgs sample was 23.1% fines (silt and clay), 76.8% sand (fine to coarse), and 0.1% gravel (fine); and for the 40 to 50 feet bgs sample was 15.8% fines (silt and clay), and 84.2% sand (fine to coarse). The material description for the 0 to 0.5 feet bgs sample was a yellowish red to dark red, silty sand to clayey sand; and the 40 to 50 feet bgs sample was described as pink to reddish-brown silty sand.

3.3.3 Conclusions

PFOS was detected in soil at concentrations above the RSL in all surface soil samples collected at AFFF Release Area 3. PFOA and PFBS were detected in soil, but at concentrations below the calculated RSLs.

3.4 AFFF RELEASE AREA 4: HANGARS 119 AND 133

Hangars 119 and 133 are general storage warehouse/hangars located in the west central portion of the installation, west of the flight apron, with multiple accidental AFFF releases. Due to the large volume of AFFF reportedly released at Hangars 119 and 133, there is the potential that AFFF migrated to grassy areas and infield soils adjacent to both locations.

3.4.1 Soil Sample Locations and Methodologies

Two soil borings (SB04001 and SB04002) were advanced north of Hangar 133 and west of Hangar 119 area on 16 November 2017 (**Figure 3.4-1**). One soil boring (SB04001) was completed on the north side of the grassy area, immediately downslope (southwest) of Hangar 119. The second soil boring (SB04002) was completed on the south side of the grassy area, adjacent to Hangar 133 in a location where AFFF released from the hangar likely accumulated after being directed to the in-field soil. Surface soil samples were collected from 0 to 0.5 feet bgs and subsurface soil samples were collected between 28 and 30 feet bgs. Samples were collected for PFAS analysis.

Two composite soil samples were also collected with soil from each boring; the first composite sample consisted of soil from the 0 to 0.5 feet bgs sampling interval and the second composite sample consisted of soil from the 28 to 30 feet bgs sampling interval. Composite samples were analyzed for TOC, pH, and particle size analysis.

3.4.2 Soil Analytical Results

Two surface soil samples and three subsurface soil samples (two normal and one field duplicate) were collected from borings SB04001 and SB04002 on 16 November 2017. PFAS results are provided in **Table 3.1-1**, illustrated on **Figure 3.4-2**, and are summarized below.

SB04001:

- PFOS was detected above the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.42 mg/kg, and was detected below the RSL at the subsurface sampling interval (28 to 30 feet bgs) at an approximate concentration of 0.00097 mg/kg (field duplicate).
- PFOA was detected below the RSL at both sampling intervals at a maximum concentration of 0.003 mg/kg (0 to 0.5 feet bgs).
- PFBS was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at an approximate concentration of 0.00035 mg/kg. PFBS was not detected in either the normal or duplicate sample collected in the subsurface sampling interval.

SB04002:

- PFOS was detected above the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.40 mg/kg. PFOS was not detected in the subsurface sample collected between 28 and 30 feet bgs.
- PFOA was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.006 mg/kg but was not detected in the subsurface sample collected between 28 and 30 feet bgs.
- PFBS was not detected in the surface soil sample (0 to 0.5 feet bgs) but was detected below the RSL in the subsurface sample (28 to 30 feet bgs) at an approximate concentration of 0.0091 mg/kg.

Physiochemical properties analysis of composite samples indicated TOC concentrations of 5,250 mg/kg in the surface soil (0 to 0.5 feet bgs) and 4,460 mg/kg in the subsurface soil (28 to 30 feet bgs); and, pH of 7.97 S.U. in the surface soil (0 to 0.5 feet bgs) and 8.48 S.U. in the subsurface soil (28 to 30 feet bgs). Physiochemical properties analytical test results are presented in **Table 3.1-2**.

The particle size analytical results for the surface soil sample was 37.3% fines (silt and clay), 61.2% sand (fine to coarse) and 1.5% gravel (fine); and the subsurface sample was 12.1% fines (silt and clay), 53.4% sand (fine to coarse), and 34.5% gravel (fine). The material description for the 0 to 0.5 feet bgs sample was a dark red silty sand, while the 28 to 30 feet bgs sample was described as pink silty sand.

3.4.3 Conclusions

PFOS was detected in soil at concentrations above the RSL at AFFF Release Area 4. PFOA and PFBS were detected in soil, but at concentrations below the respective RSL.

3.5 AFFF RELEASE AREA 5: FORMER SEWAGE LAGOONS

The former sewage lagoons consisted of two unlined surface impoundments that were used from 1966 to 1998 and received sanitary and industrial waste from base facilities prior to the construction of the WWTP. The former sewage lagoons would have received any AFFF that entered the sanitary sewer system from 1966 to 1998. Documented releases of AFFF to the sanitary sewer system from Hangars 199 and 208 were reported prior to and during 1998. As such, there is evidence that AFFF was released to the environment at the former sewage lagoons.

3.5.1 Soil Sample Locations and Methodologies

Five soil borings (SB05001, SB05002, SB05003, SB05004, and SB05005) were advanced at the former sewage lagoons on 18 November 2017 (**Figure 3.5-1**). Two subsurface samples were collected from each boring, including a shallow subsurface sample immediately below the sludge/soil layer based on field observations and a second sample collected within the depth range of 8 to 10 ft bgs. Samples were collected for PFAS analysis.

Two composite soil samples were also collected with soil from each boring; the first composite sample consisted of soil from the 4 to 5 feet bgs sampling interval and the second composite sample consisted of soil from the 8 to 10 feet bgs sampling interval. Composite samples were analyzed for TOC, pH, and particle size analysis.

3.5.2 Soil Analytical Results

Eleven subsurface soil samples (ten normal and one field duplicate) were collected for PFAS analysis, with the results provided in **Table 3.1-1**, illustrated in **Figure 3.5-2**, and are summarized below.

SB05001:

- PFOS was detected below the RSL at both subsurface (4 to 5 feet bgs and 9 to 10 feet bgs) sampling intervals at a maximum concentration of 0.042 mg/kg (9 to 10 feet bgs).
- PFOA was detected below the RSL at both subsurface (4 to 5 feet bgs and 9 to 10 feet bgs) sampling intervals at a maximum concentration of 0.0031 mg/kg (4 to 5 feet bgs).
- PFBS was detected below the RSL at both subsurface (4 to 5 feet bgs and 9 to 10 feet bgs) sampling intervals at an approximate maximum concentration of 0.0017 mg/kg (9 to 10 feet bgs).

SB05002:

- PFOS was detected below the RSL at both subsurface (4 to 5 feet bgs and 9 to 10 feet bgs) sampling intervals at a maximum concentration of 0.0081 mg/kg (4 to 5 feet bgs).
- PFOA was detected below the RSL at both subsurface (4 to 5 feet bgs and 9 to 10 feet bgs) sampling intervals at a maximum concentration of 0.0015 mg/kg (4 to 5 feet bgs).

- PFBS was not detected in either subsurface sampling interval

SB05003:

- PFOS was detected below the RSL at both subsurface (4 to 5 feet bgs and 8 to 9 feet bgs) sampling intervals at a maximum approximate concentration of 0.041 mg/kg (8 to 9 feet bgs).
- PFOA was detected below the RSL at both subsurface (4 to 5 feet bgs and 8 to 9 feet bgs) sampling intervals at a maximum approximate concentration of 0.0041 mg/kg (8 to 9 feet bgs).
- PFBS was detected below the RSL at the two sampling intervals at a maximum approximate concentration of 0.00037 mg/kg (8 to 9 feet bgs).

SB05004:

- PFOS was detected above the RSL at both subsurface (4 to 5 feet bgs and 9 to 10 feet bgs) sampling intervals at a maximum concentration of 0.29 mg/kg (9 to 10 feet bgs).
- PFOA was detected below the RSL at both subsurface (4 to 5 feet bgs and 9 to 10 feet bgs) sampling intervals at a maximum concentration of 0.019 mg/kg (9 to 10 feet bgs).
- PFBS was detected below the RSL at the two sampling intervals at a maximum approximate concentration of 0.00089 mg/kg (9 to 10 feet bgs).

SB05005:

- PFOS was detected above the RSL at the subsurface (9 to 10 feet bgs) sampling interval at a concentration of 0.25 mg/kg, and was detected below the RSL at the remaining subsurface (4 to 5 feet bgs) sampling interval at a concentration of 0.0086 mg/kg.
- PFOA was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.023 mg/kg (9 to 10 feet bgs).
- PFBS was detected below the RSL at the subsurface (9 to 10 feet bgs) sampling interval at an approximate concentration of 0.00061 mg/kg, and was not detected at the surface (0 to 0.5 feet bgs) sampling interval.

Physiochemical properties analysis of composite samples indicated TOC concentrations of 7,330 mg/kg in the subsurface sample interval from 4 to 5 feet bgs and 19,000 mg/kg in the deeper subsurface sample collected between 8 and 10 feet bgs. The composite pH was 7.56 S.U. (4 to 5 feet bgs) and 7.01 S.U. (8 to 10 feet bgs). Physiochemical properties analytical test results are presented in **Table 3.1-2**.

The particle size analytical results for the 4 to 5 feet bgs sample was 45.7% fines (silt and clay), 41.4% sand (fine to coarse), and 12.9% gravel (fine); and, the 8 to 10 feet bgs sample was 43.8% fines (silt and clay), 51.9% sand (fine to coarse), and 4.3% gravel (fine). The material description for the 4 to 5 feet bgs sample was a reddish-brown, sandy silt with trace organics, and the 8 to 10 feet bgs sample was described as a reddish-gray sandy silt.

3.5.3 Conclusions

PFOS was detected in soil at concentrations above calculated RSLs at AFFF Release Area 5. PFOA and PFBS were detected in soil, but at concentrations below the RSLs.

3.6 AFFF RELEASE AREA 6: NORTH PLAYA LAKE OUTFALL

North Playa Lake, located southeast of the WWTP, received all the Cannon AFB sanitary and industrial wastewater from 1943 to 1966. Currently, all treated effluent from the WWTP is released primarily to North Playa Lake with a portion also released to the golf course for irrigation. Since there is no accepted wastewater treatment process for PFAS, any wastewater collected at the WWTP containing PFAS would be passed on to North Playa Lake.

3.6.1 Sample Locations and Methodologies

3.6.1.1 Sediment Samples

Two sediment samples (SD06001 and SD06002) were collected from North Playa Lake on 30 November 2017; one sample (SD06001) was collected at the WWTP outfall location on the west side of the playa and the second sample (SD06002) was collected from the northeast portion of the playa (**Figure 3.6-1**).

3.6.1.2 Surface Water Samples

Two surface water samples (SW06001 and SW06002) were collected from North Playa Lake at locations paired with the sediment samples on 30 November 2017. One surface water sample (SW06001) was collected at the WWTP outfall location on the west side of the playa and the second sample (SW06002) was collected from the northeast portion of the playa (**Figure 3.6-1**).

3.6.2 Analytical Results

3.6.2.1 Sediment Results

Two sediment samples were collected for PFAS analysis, with the results provided in **Table 3.1-3**, illustrated in **Figure 3.6-2**, and are summarized below.

SD06001:

- PFOS was detected below the RSL at a concentration of 0.039 mg/kg.
- PFOA was not detected.
- PFBS was not detected.

SD06002:

- PFOS was detected below the RSL at a concentration of 0.0098 mg/kg.
- PFOA was not detected.
- PFBS was not detected.

3.6.2.2 Surface Water Results

Two surface water samples were collected for PFAS analysis, with the results provided in **Table 3.1-4**, illustrated in **Figure 3.6-3**, and are summarized below.

SW06001:

- PFOS was detected above the HA value at a concentration of 0.11 µg/L.
- PFOA was detected below the HA value at an approximate concentration of 0.013 µg/L.
- PFOS+PFOA was detected above the HA value at an approximate concentration of 0.123 µg/L.
- PFBS was detected below the calculated Tap Water RSL at an approximate concentration of 0.024 µg/L.

SW06002:

- PFOS was detected above the HA value at an approximate concentration of 0.072 µg/L.
- PFOA was detected below the HA value at an approximate concentration of 0.027 µg/L.
- PFOS+PFOA was detected above the HA value at an approximate concentration of 0.099 µg/L.
- PFBS was detected below the calculated Tap Water RSL at an approximate concentration of 0.049 µg/L.

3.6.3 Conclusions

PFOS was detected below the RSL in sediment at AFFF Release Area 6. PFOS and PFOS+PFOA were detected at concentrations above the HA at both surface water sampling locations. PFOA and PFBS were detected at concentrations below the HA or Tap Water RSL.

3.7 AFFF RELEASE AREA 7: SOUTH PLAYA LAKE OUTFALL

The South Playa Lake Outfall is located in the southwest portion of Cannon AFB and serves as the installation's primary stormwater collection point. The lake has received stormwater runoff from portions of the flightline area since 1943. Solvents, fuels, oils, greases, and AFFF are all potential contaminants that would have discharged to the lake from the flightline area. Documented releases of AFFF in the hangars resulted in AFFF entering storm drains with liquid being subsequently routed to South Playa Lake.

3.7.1 Soil Sample Locations and Methodologies

3.7.1.1 Soil Samples

Four soil borings (SB07001, SB07002, SB07003, and SB07004) were advanced beneath the South Playa Lake Outfall on 28 and 29 November 2017. One soil boring was completed at, or in the vicinity of, the location of each sewer outfall from the flightline area; one boring was located on the west side of the playa (SB07001), a second located at the end of a drainage channel connecting to the northern sewer discharge (SB07002), and a third located in the northeastern portion of the playa (SB07003). A fourth soil boring (SB07004) was completed in the center of the South Playa Lake at an area where water, would accumulate (**Figure 3.7-1**). Due to access limitations, the locations of SB07001, SB07002 and SB07003 deviated from the locations proposed in the ISWP. SB07001 and SB07003 were moved to the east (SB07001) or west (SB07003) due to the presence of engineered structures (rip-rap) at each outfall. The borings were therefore drilled downslope of the engineered structures. The proposed location for SB07002 could not be completed as drainage from the northern outfall flows into a deep, steep-sided gully that channels the water from the outfall to the south into the north central portion of the playa. The

SB07002 location was therefore moved to the observed end of the drainage channel at a location safely accessible for the drill rig.

Surface soil samples were collected from 0 to 5 feet bgs and subsurface soil samples were collected from 23 to 25 feet bgs, for PFAS analysis.

Two composite soil samples were also collected with soil from each boring; the first composite sample consisted of soil from the 0 to 0.5 feet bgs sampling interval and the second composite sample consisted of soil from the 23 to 25 feet bgs sampling interval. Composite samples were analyzed for TOC, pH, and particle size analysis.

3.7.2 Soil Analytical Results

Nine soil samples (eight normal and one field duplicate) were collected for PFAS analysis, with the results provided in **Table 3.1-1**, illustrated in **Figure 3.7-2**, and are summarized below.

SB07001:

- PFOS was detected below the RSL at the surface (0 to 0.5 feet bgs) sampling interval at a concentration of 0.0013 mg/kg, and was not detected at the subsurface (23 to 25 feet bgs) sampling interval.
- PFOA was not detected at either sampling interval.
- PFBS was not detected at either sampling interval.

SB07002:

- PFOS was detected below the RSL at both sampling intervals at a maximum concentration of 0.018 mg/kg (23 to 25 feet bgs).
- PFOA was detected below the RSL at both sampling intervals at a maximum approximate concentration of 0.00057 mg/kg (0 to 0.5 feet bgs).
- PFBS was not detected at either sampling interval.

SB07003:

- PFOS was detected below the RSL at both sampling intervals at a maximum concentration of 0.002 mg/kg (23 to 25 feet bgs).
- PFOA was not detected at either sampling interval.
- PFBS was not detected at either sampling interval.

SB07004:

- PFOS was detected below the RSL at both sampling intervals at a maximum concentration of 0.085 mg/kg (0 to 0.5 feet bgs).
- PFOA was detected below the RSL at both sampling intervals at a maximum concentration of 0.0022 mg/kg (0 to 0.5 feet bgs).
- PFBS was not detected in either sampling interval.

Physiochemical properties analysis of composite samples indicated TOC concentrations of 16,300 mg/kg in the surface sample interval from 0 to 0.5 feet bgs and 1,730 mg/kg in the subsurface sample collected between 23 and 25 feet bgs. The composite pH was 7.79 S.U. (0 to 0.5 feet bgs) and 8.36 S.U. (23 to 25 feet bgs). Physiochemical properties analytical test results are presented in **Table 3.1-2**.

The particle size analytical results for the 0 to 0.5 feet bgs sample was 23.1% fines (silt and clay), 59.1% sand (fine to coarse), and 17.8% gravel (fine); and, the subsurface sample collected between 23 and 25 feet bgs sample was 21% fines (silt and clay), and 79% sand (fine to coarse). The material description for the 0 to 0.5 feet bgs sample was a white to brown silty gravel with sand to silty clay, while the 23 to 25 feet bgs sample was described as a pink to yellowish-red, silty sand to clayey sand.

3.7.3 Conclusions

PFOS and PFOA were detected in soil at AFFF Release Area 7 at concentrations below the calculated RSLs. PFBS was not detected in surface or subsurface soil.

3.8 AFFF RELEASE AREA 8: WHISPERING WINDS GOLF COURSE OUTFALL

The installation golf course began receiving a portion of the treated effluent from the WWTP to fill ponds and irrigate the greens in approximately 2002. According to the golf course supervisor, the golf course is irrigated five nights per week for approximately four hours per night using a sprinkler system. Any wastewater collected at the WWTP containing AFFF therefore has the potential to be released at the golf course.

3.8.1 Sample Location and Methodologies

3.8.1.1 Sediment Samples

Three sediment samples (two normal and one field duplicate) were collected within the Whispering Winds Golf Course Outfall on 30 November 2017. One sediment sample (SD08001) was collected from Pond 1 at a location near the effluent pipe outlet from the WWTP/effluent tank. The second sediment sample was collected in Pond 2 near the pipe outlet discharge from Pond 1 (**Figure 3.8-1**).

3.8.1.2 Surface Water Samples

Two surface water samples were proposed to be collected, one from each of the ponds located at the Whispering Winds Golf Course Outfall; however, no water was present in Pond 2 during the SI and therefore no surface water sample was collected at that location. The surface water sample from Pond 1 (SW08001) was collected on 28 November 2017 (**Figure 3.8-1**).

3.8.2 Analytical Results

3.8.2.1 Sediment Results

Three sediment samples (two normal and one field duplicate) were collected for PFAS analysis, with the results provided in **Table 3.1-3**, illustrated in **Figure 3.8-2**, and are summarized below.

SD08001:

- PFOS was detected below the RSL in the normal and field duplicate samples at a maximum concentration of 0.077 mg/kg.
- PFOA was not detected.
- PFBS was not detected.

SD08002:

- PFOS was detected below the RSL at a concentration of 0.012 mg/kg.
- PFOA was not detected.
- PFBS was not detected.

3.8.2.2 Surface Water Results

Two surface water samples (one normal and one field duplicate) were collected for PFAS analysis, with the results provided in **Table 3.1-4**, illustrated in **Figure 3.8-3**, and summarized below.

SW08001:

- PFOS was detected below the HA value at a maximum concentration of 0.041 µg/L.
- PFOA was not detected.
- PFOS+PFOA was calculated at a concentration of 0.041 µg/L (below the HA).
- PFBS was not detected.

3.8.3 Conclusions

PFOS was detected in sediment and surface water at AFFF Release Area 8 at concentrations below the USEPA RSL or HA (as applicable). PFOA and PFBS were not detected in either sediment or surface water.

3.9 AFFF RELEASE AREA 9: HANGAR 109

Hangar 109 is a parking and general maintenance hangar located in the west central portion of Cannon AFB, with two accidental AFFF releases. Approximately 500 gallons of AFFF was released to a floor trench and eventually the WWTP and 20 to 30 gallons of AFFF was released west and southwest outside of the hangar and was allowed to evaporate.

3.9.1 Soil Sample Location and Methodologies

Two soil borings (SB09001 and SB09002) were advanced adjacent to Hangar 109 on 16 November 2017. One soil boring (SB09001) was completed in the grassy area on the west side of the hangar in an area where AFFF staining was observed on the concrete apron extending into the grassy area. The second boring (SB09002) was completed on the northwest side of the hangar in a grassy area across from the mechanical room where AFFF was released (**Figure 3.9-1**). Surface soil samples were collected from 0 to 0.5 feet bgs and subsurface soil samples were collected from 28 to 30 feet bgs, for PFAS analysis.

Two composite soil samples were also collected with soil from each boring; the first composite sample consisted of soil from the 0 to 0.5 feet bgs sampling interval and the second composite sample consisted

of soil from the 28 to 30 feet bgs sampling interval. Composite samples were analyzed for TOC, pH, and particle size analysis.

3.9.2 Soil Analytical Results

Three surface soil samples (two primary and one field duplicate) and two subsurface soil samples were collected from borings SB09001 and SB09002, on 16 November 2017. PFAS results are provided in **Table 3.1-1**, illustrated on **Figure 3.9-2**, and are summarized below.

SB09001:

- PFOS was detected above the RSL in the surface soil sample (0 to 0.5 feet bgs) at a maximum concentration of 0.23 mg/kg (in the field duplicate). PFOS was not detected in the subsurface soil sample collected between 28 and 30 feet bgs.
- PFOA was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at an approximate concentration of 0.027 mg/kg. PFOA was not detected in the subsurface soil sample collected between 28 and 30 feet bgs.
- PFBS was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at an approximate concentration of 0.00023 mg/kg. PFBS was not detected in the subsurface soil sample collected between 28 and 30 feet bgs.

SB09002:

- PFOS was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a maximum concentration of 0.058 mg/kg. PFOS was not detected in the subsurface soil sample collected between 28 and 30 feet bgs.
- PFOA was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a maximum concentration of 0.0059 mg/kg. PFOA was not detected in the subsurface soil sample collected between 28 and 30 feet bgs.
- PFBS was not detected at either sampling interval.

Physiochemical properties analysis of composite samples indicated TOC concentrations of 10,200 mg/kg in the surface sample interval from 0 to 0.5 feet bgs and 2,410 mg/kg in the subsurface sample collected between 28 and 30 feet bgs. The composite pH was 7.88 S.U. (0 to 0.5 feet bgs) and 8.63 S.U. (28 to 30 feet bgs). Physiochemical properties analytical test results are presented in **Table 3.1-2**.

The particle size analytical results for the 0 to 0.5 feet bgs sample was 33.1% fines (silt and clay), 49.1% sand (fine to coarse), and 17.8% gravel (fine), while the 28 to 30 feet bgs sample was 24.3% fines (silt and clay), 66.4% sand (fine to coarse), and 9.3% gravel (fine). The material description for the 0 to 0.5 feet bgs sample was a red, silty sand with gravel, while the 28 to 30 feet bgs sample was described as a pinkish-white to reddish yellow, silty sand.

3.9.3 Conclusions

PFOS was detected in soil at concentrations above the calculated RSL in AFFF Release Area 9. PFOA and PFBS were detected in soil, but at concentrations below the RSLs.

3.10 AFFF RELEASE AREA 10: LANDFILL #4

Landfill #4 is a closed landfill covering approximately 7 acres in the east central portion of Cannon AFB that was only operational for one year between 1967 and 1968. Due to the period of operation, AFFF would not have been included in landfilled refuse; however, the landfill cover was revegetated and was irrigated with water from North Playa Lake, located immediately south of Landfill #4, which receives treated effluent from the WWTP.

3.10.1 Sample Location and Methodologies

SI activities relative to AFFF Release Area 10 were limited to groundwater sampling of an existing monitoring well downgradient of the landfill (LF04-MW-Na). The location of the landfill and downgradient monitoring well are shown on **Figure 3.10.1**. Since NMED regulates groundwater at Cannon AFB from a basewide perspective, analytical results for the subject monitoring well are presented within the basewide groundwater monitoring results (Section 3.14).

3.11 AFFF RELEASE AREA 11: ACTIVE FTA

The active FTA is located in the southeast portion of the installation and became operational in 1997. It consists of a circular lined burn pit with a mockup of a large aircraft, a propane fuel tank, a control panel and a lined evaporation pond. Fire training exercises are conducted at the active FTA approximately monthly using water or AFFF. The fire department also conducts annual vehicle foam checks at the FTA. Liquids discharged into the lined burn pit, including water and AFFF, drain to the lined evaporation pond located approximately 300 ft southwest of the pit and are left to evaporate. According to installation personnel, the liner of the evaporation pond has required repairs in the past, and any breaches in the liner would allow AFFF to infiltrate into the soils beneath the liner. Additionally, storms in May 2015 resulted in significant flash flooding across the installation, which likely resulted in any residual AFFF located in the evaporation pond to overflow and be released to the surrounding environment.

3.11.1 Soil Sample Locations and Methodologies

Three soil borings (SB11001, SB11002, and SB11003) were advanced at AFFF Release Area 11 on 17 November 2017 (**Figure 3.11-1**). One boring (SB11001) was completed west of the evaporation pond; one soil boring (SB11002) was completed south of the evaporation pond; and one boring was completed east of the evaporation pond (SB11003). Due to access limitations, all borings were completed outside the fenced evaporation pond enclosure. Due to the presence of subsurface utilities and piping runs from a propane tank located on the east side of the pond, SB11003 was moved to the east of the proposed location.

Surface soil samples were collected from 0 to 0.5 feet bgs and subsurface soil samples were collected from 23 to 25 feet bgs, for PFAS analysis.

Two composite soil samples were also collected with soil from each boring; the first composite sample consisted of soil from the 0 to 0.5 feet bgs sampling interval and the second composite sample consisted

of soil from the 23 to 25 feet bgs sampling interval. Composite samples were analyzed for TOC, pH, and particle size analysis.

3.11.2 Soil Analytical Results

Three surface soil samples and three subsurface soil samples were collected from borings SB011001, SB11002, and SB11003 on 17 November 2017. PFAS results are provided in **Table 3.1-1**, illustrated on **Figure 3.11-2**, and are summarized below.

SB11001:

- PFOS was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.079 mg/kg. PFOS was not detected in the subsurface soil sample collected between 23 and 25 feet bgs.
- PFOA was detected below the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 0.011 mg/kg. PFOA was not detected in the subsurface soil sample collected between 23 and 25 feet bgs.
- PFBS was not detected at either sampling interval.

SB11002:

- PFOS was detected above the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 1.1 mg/kg. PFOS was detected below the RSL in the subsurface soil sample collected between 23 and 25 feet bgs at an approximate concentration of 0.00063 mg/kg.
- PFOA was not detected in either sampling interval.
- PFBS was not detected in either sampling interval.

SB11003:

- PFOS was detected above the RSL in the surface soil sample (0 to 0.5 feet bgs) at a concentration of 1.1 mg/kg. PFOS was not detected in the subsurface soil sample collected between 23 and 25 feet bgs.
- PFOA was not detected at either sampling interval.
- PFBS was not detected at either sampling interval.

Physiochemical properties analysis of composite samples indicated TOC concentrations of 6,520 mg/kg in the surface sample interval from 0 to 0.5 feet bgs and 13,000 mg/kg in the subsurface sample collected between 23 and 25 feet bgs. The composite pH was 8.16 S.U. (0 to 0.5 feet bgs) and 8.32 S.U. (23 to 25 feet bgs). Physiochemical properties analytical test results are presented in **Table 3.1-2**.

The particle size analytical results for the 0 to 0.5 feet bgs sample was 38.5% fines (silt and clay), 54.2% sand (fine to coarse), and 7.3% gravel (fine); and the 23 to 25 feet bgs sample was 31.8% fines (silt and clay), 64% sand (fine to coarse), and 4.2% gravel (fine). The material description for the 0 to 0.5 feet bgs sample was a yellowish red to dark reddish brown sandy silt to silty sand, while the 23 to 25 feet bgs sample was described as a pink sandy silt to silty sand.

3.11.3 Conclusions

PFOS was detected above the RSL in surface soil at AFFF Release Area 11. PFOA was detected in soil at concentrations below the RSL. PFBS was not detected in soil at AFFF Release Area 11.

3.12 AFFF RELEASE AREA 12: PERIMETER ROAD FUEL SPILL

A fuel tanker truck overturned while traveling along Perimeter Road in the southeast corner of the installation. All fuel from the tanker was released on the southeast side of the road. The installation fire department responded with crash trucks and reportedly sprayed AFFF on the fuel spill. The response was conducted over several days with multiple fire trucks discharging their entire supply of AFFF on the release. Installation personnel identified that contaminated soils were excavated; however, the excavation depth was unknown.

3.12.1 Soil Sampling Location and Methodology

One soil boring (SB12001) was advanced at the Perimeter Road fuel spill on 18 November 2017 (**Figure 3.12-1**). Subsurface soil samples were collected from 8 to 10 feet bgs and 28 to 30 feet bgs, for PFAS and physiochemical properties (TOC, pH, and particle size) analysis.

3.12.2 Soil Analytical Results

Two subsurface soil samples were collected from boring SB012001 on 18 November 2017. PFAS results are provided in **Table 3.1-1**, illustrated on **Figure 3.12-2**, and are summarized below.

SB12001:

- PFOS was not detected at either sampling interval.
- PFOA was not detected at either sampling interval.
- PFBS was not detected at either sampling interval.

Physiochemical properties analysis of the soil samples indicated TOC concentrations of 2,690 mg/kg in the subsurface sample interval from 8 to 10 feet bgs and 2,320 mg/kg in the subsurface sample collected between 28 and 30 feet bgs. The pH was 8.67 S.U. (8 to 10 feet bgs) and 8.58 S.U. (28 to 30 feet bgs). Physiochemical properties analytical test results are presented in **Table 3.1-2**.

The particle size analytical results for the 8 to 10 feet bgs sample was 27.4% fines (silt and clay), 53.7% sand (fine to coarse), and 18.9% gravel (fine); and the 28 to 30 feet bgs sample was 24.5% fines (silt and clay), 70.4% sand (fine to coarse), and 5.1% gravel (fine). The material description for the 8 to 10 feet bgs sample was a reddish yellow to reddish brown, sandy silt, while the 28 to 30 feet bgs sample was described as a pink silty sand.

3.12.3 Conclusions

PFOS, PFOA and PFBS were not detected in soil at AFFF Release Area 12.

3.13 AFFF RELEASE AREA 13: FLIGHTLINE AIRCRAFT CRASHES

Cannon AFB Fire Department personnel identified three aircraft crashes that had occurred along the flightline where the fire department responded with the use of AFFF. Two incidents involving F-16 aircraft were identified at the southern end of the flightline, and a third incident involving an F-111 aircraft occurred at the north end of the flightline. No records regarding the crash responses had been maintained and no information regarding the amount of AFFF released was known.

3.13.1 Sample Location and Methodologies

SI activities relative to AFFF Release Area 13 were limited to groundwater sampling of existing monitoring wells downgradient of the flightline and potential crash site locations. The approximate crash site locations are shown on **Figure 3.13.1**. Since NMED regulates groundwater at Cannon AFB from a basewide perspective, analytical results for the monitoring wells downgradient of subject area are presented within the basewide groundwater monitoring results (Section 3.14).

3.14 AFFF RELEASE AREA 14: BASEWIDE GROUNDWATER SAMPLING

A total of 18 existing monitoring wells were sampled for PFAS, a majority of which are located downgradient of one or more AFFF release areas. Only 15 monitoring wells were proposed to be sampled in the ISWP; however, three additional monitoring wells (MW-Sa, MW-Ta, and MW-Ua) were added to the sampling program at the request of AFCEC. The three new wells were installed at the installation in August 2017 by FPM Remediations Inc., to replace monitoring wells (MW-S, MW-T and MW-U) that had become dry due to declining groundwater levels.

3.14.1 Sample Location and Methodologies

3.14.1.1 Groundwater Samples

Eighteen existing monitoring wells were sampled basewide between 30 November and 14 December 2017 to assess PFAS concentrations in existing groundwater monitoring wells (**Figure 3.14-1**).

3.14.2 Analytical Results

3.14.2.1 Groundwater Results

Twenty groundwater samples (including 18 primary samples and two field duplicate samples) were collected for PFAS analysis, with the results provided in **Table 3.1-5**, illustrated in **Figure 3.14-2**, and are summarized below.

LF03-MW-Oa:

- PFOS was detected below the HA at an approximate concentration of 0.0086 µg/L.
- PFOA was detected below the HA at a concentration of 0.042 µg/L.
- PFOS+PFOA was calculated below the HA at an approximate concentration of 0.0506 µg/L.
- PFBS was detected below the Tap Water RSL at an approximate concentration of 0.096 µg/L.

LF04-MW-Na:

- PFOS was not detected.
- PFOA was not detected.
- PFBS was not detected.

LF25-MW-Pa

- PFOS was detected above the HA at a maximum estimated concentration of 0.087 µg/L (field duplicate).
- PFOA was detected below the HA at a maximum approximate concentration of 0.045 µg/L.
- PFOS+PFOA was calculated above the HA at a maximum approximate concentration of 0.13 µg/L.
- PFBS was detected below the Tap Water RSL at a maximum approximate concentration of 0.049 µg/L.

LF25-MW-Rb

- PFOS was not detected.
- PFOA was not detected.
- PFBS was not detected.

MW-A

- PFOS was not detected.
- PFOA was not detected.
- PFBS was detected below the Tap Water RSL at an estimated concentration of 0.0062 µg/L.

MW-B

- PFOS was not detected.
- PFOA was detected below the HA at a concentration of 0.023 µg/L.
- PFOS+PFOA was calculated below the HA at a concentration of 0.023 µg/L.
- PFBS was detected below the Tap Water RSL at an approximate concentration of 0.079 µg/L.

MW-Ca

- PFOS was detected above the HA at a concentration of 24 µg/L.
- PFOA was detected above the HA at a concentration of 2.2 µg/L.
- PFOS+PFOA was calculated above the HA at a concentration of 26.2 µg/L.
- PFBS was detected below the Tap Water RSL at a concentration of 0.84 µg/L.

MW-D

- PFOS was detected above the HA at a maximum concentration of 0.79 µg/L.
- PFOA was detected above the HA at a maximum concentration of 3.1 µg/L (field duplicate).
- PFOS+PFOA was calculated above the HA at a maximum concentration of 3.85 µg/L (field duplicate).

- PFBS was detected below the Tap Water RSL at a maximum concentration of 0.29 µg/L.

MW-E

- PFOS was not detected.
- PFOA was not detected.
- PFBS was not detected.

MW-Fa

- PFOS was not detected.
- PFOA was not detected.
- PFBS was not detected.

MW-Ga

- PFOS was detected above the HA at a concentration of 0.13 µg/L.
- PFOA was detected above the HA at a concentration of 0.071 µg/L.
- PFOS+PFOA was calculated above the HA at a concentration of 0.201 µg/L.
- PFBS was detected below the Tap Water RSL at an approximate concentration of 0.11 µg/L.

MW-H

- PFOS was detected below the HA at a concentration of 0.041 µg/L.
- PFOA was detected below the HA at an approximate concentration of 0.019 µg/L.
- PFOS+PFOA was calculated below the HA at an approximate concentration of 0.06 µg/L.
- PFBS was detected below the Tap Water RSL at an approximate concentration of 0.0074 µg/L.

MW-Sa

- PFOS was detected above the HA at an approximate concentration of 0.15 µg/L.
- PFOA was detected above the HA at a concentration of 1.5 µg/L.
- PFOS+PFOA was calculated above the HA at an approximate concentration of 1.65 µg/L.
- PFBS was detected below the Tap Water RSL at a concentration of 0.71 µg/L.

MW-Ta

- PFOS was not detected.
- PFOA was detected above the HA value at a concentration of 0.24 µg/L.
- PFOS+PFOA was calculated above the HA at a concentration of 0.24 µg/L.
- PFBS was detected below the Tap Water RSL at a concentration of 0.37 µg/L.

MW-Ua

- PFOS was not detected.
- PFOA was detected below the HA at an approximate concentration of 0.01 µg/L.
- PFOS+PFOA was calculated below the HA at an approximate concentration of 0.01 µg/L.
- PFBS was detected below the Tap Water RSL at an approximate concentration of 0.048 µg/L.

MW-V

- PFOS was not detected.
- PFOA was not detected.
- PFBS was not detected.

MW-W

- PFOS was not detected.
- PFOA was not detected.
- PFBS was not detected.

MW-X

- PFOS was not detected.
- PFOA was not detected.
- PFBS was not detected.

3.14.3 Conclusions

PFOS, PFOA, and/or PFOS+PFOA in groundwater exceeded the HA at six monitoring wells at Cannon AFB. The monitoring wells with PFAS detections above the HA include monitoring wells MW-GA and LF25-MW-PA located in the east-central portion of the installation, southeast of the sewage lagoon area (AFFF Release Area 5); and, monitoring wells MW-Ca, MW-D, MW-Sa and MW-Ta, located in the southeast corner of the installation.

PFBS was not detected above the Tap Water RSL in groundwater.

5.0 SUMMARY AND CONCLUSIONS

As stated in the introduction, the objectives of this study were to:

- Determine if PFOS, PFOA, or PFBS are present in soil, groundwater, sediment, or surface water at AFFF release areas selected for SI;
- Determine if PFOS and PFOA concentrations in soil exceed the calculated RSL, based on a residential scenario, of 0.126 mg/kg, and if PFBS concentrations in soil exceed the residential RSL of 130 mg/kg;
- Determine if PFOS, PFOA, or the sum of PFOS and PFOA concentrations in groundwater exceed the HA value of 0.07 µg /L, and if PFBS concentrations in groundwater exceed the Tap Water RSL of 40 µg/L;
- Determine if PFOS and PFOA concentrations in sediment exceed the calculated RSL, based on a residential scenario of 0.126 mg/kg, and if PFBS concentrations in sediment exceed the residential RSL of 130 mg/kg;
- Determine if PFOS, PFOA, or sum of PFOS and PFOA concentrations in surface water exceed the HA value of 0.07 µg /L; and,
- Identify potential receptor pathways with immediate impacts to human health (immediate impact to human health is considered consumption of drinking water with PFOS/PFOA above the HA value, or PFBS above the USEPA Tap Water RSL).

Section 3 of this SI detailed the analytical results for PFAS at each AFFF release area. A summary table (**Table 5.0-1**) is also provided below which lists specific exceedances by area and media, fulfilling the objectives of the SI.

Table 5.0-1. Summary of Analytical Results and Screening Level Exceedances.

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level	Potentially Complete DW Exposure Pathway	Recommendation
AFFF Release Area 1 Former FTA No. 2	Surface Soil (0 to 0.5 feet)						No	NFRAP
	PFOS	0.049	0.126	mg/kg	2/0	No		
	PFOA	0.0013	0.126	mg/kg	2/0	No		
	PFBS	ND	130	mg/kg	2/0	No		
	Subsurface Soil (28 to 30 feet)							
	PFOS	0.0053	0.126	mg/kg	2/0	No		
	PFOA	0.035	0.126	mg/kg	2/0	No		
	PFBS	ND	130	mg/kg	2/0	No		
AFFF Release Area 2 Former FTA No. 3	Surface Soil (0 to 0.5 feet)						No	Advance Area to RI
	PFOS	**0.24**	0.126	mg/kg	3/1	**Yes**		
	PFOA	0.0032	0.126	mg/kg	3/0	No		
	PFBS	ND	130	mg/kg	3/0	No		
	Subsurface Soil (28 to 30 feet)							
	PFOS	ND	0.126	mg/kg	2/0	No		
	PFOA	ND	0.126	mg/kg	2/0	No		
	PFBS	ND	130	mg/kg	2/0	No		
AFFF Release Area 3 Former FTA No. 4	Surface Soil (0 to 0.5 feet)						No	Advance Area to RI
	PFOS	**0.61**	0.126	mg/kg	3/3	**Yes**		
	PFOA	0.006 J	0.126	mg/kg	3/0	No		
	PFBS	ND	130	mg/kg	3/0	No		
	Subsurface Soil (23 to 50 feet)							
	PFOS	ND	0.126	mg/kg	4/0	No		
	PFOA	0.064	0.126	mg/kg	4/0	No		
	PFBS	0.039	130	mg/kg	4/0	No		
AFFF Release Area 4 Hangars 119 and 133	Surface Soil (0 to 0.5 feet)						No	Advance Area to RI
	PFOS	**0.42**	0.126	mg/kg	2/2	**Yes**		
	PFOA	0.006	0.126	mg/kg	2/0	No		
	PFBS	0.00035 B	130	mg/kg	2/0	No		
	Subsurface Soil (28 to 30 feet)							
	PFOS	0.00097 B	0.126	mg/kg	3/0	No		
	PFOA	0.0016	0.126	mg/kg	3/0	No		
	PFBS	0.00091 B	130	mg/kg	3/0	No		

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples / Number of Exceedances	Exceeds Screening Level	Potentially Complete DW Exposure Pathway	Recommendation
AFFF Release Area 5 Former Sewage Lagoons	Subsurface Soil (4 to 10 feet)						No	Advance Area to RI
	PFOS	**0.29**	0.126	mg/kg	11/3	**Yes**		
	PFOA	0.023	0.126	mg/kg	11/0	No		
	PFBS	0.0017 B	130	mg/kg	11/0	No		
AFFF Release Area 6 North Playa Lake Outfall	Sediment						No	Advance Area to RI
	PFOS	0.039	0.126	mg/kg	2/0	No		
	PFOA	ND	0.126	mg/kg	2/0	No		
	PFBS	ND	130	mg/kg	2/0	No		
	Surface Water							
	PFOS	**0.11**	0.07	µg/L	2/2	**Yes**		
	PFOA	0.027 J	0.07	µg/L	2/0	No		
	PFOS+PFOA	**0.123**	0.07	µg/L	2/2	**Yes**		
	PFBS	0.049 Q	400	µg/L	2/0	No		
AFFF Release Area 7 South Playa Lake Outfall	Surface Soil (0 to 0.5 feet)						No	NFRAP
	PFOS	0.085	0.126	mg/kg	4/0	No		
	PFOA	0.0022	0.126	mg/kg	4/0	No		
	PFBS	ND	130	mg/kg	4/0	No		
	Subsurface Soil (23 to 25 feet)							
	PFOS	0.018	0.126	mg/kg	5/0	No		
	PFOA	0.0006 J	0.126	mg/kg	5/0	No		
	PFBS	ND	130	mg/kg	5/0	No		
AFFF Release Area 8 Whispering Winds Golf Course Outfall	Sediment						No	NFRAP
	PFOS	0.077	0.126	mg/kg	3/0	No		
	PFOA	ND	0.126	mg/kg	3/0	No		
	PFBS	ND	130	mg/kg	3/0	No		
	Surface Water							
	PFOS	0.041	0.07	µg/L	2/0	No		
	PFOA	ND	0.07	µg/L	2/0	No		
	PFOS+PFOA	0.041	0.07	µg/L	2/0	No		
	PFBS	ND	400	µg/L	2/0	No		

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level	Potentially Complete DW Exposure Pathway	Recommendation
AFFF Release Area 9 Hangar 109	Surface Soil (0 to 0.5 feet)						No	Advance Area to RI
	PFOS	**0.23**	0.126	mg/kg	3/2	**Yes**		
	PFOA	0.027 J	0.126	mg/kg	3/0	No		
	PFBS	0.00023 B	130	mg/kg	3/0	No		
	Subsurface Soil (28 to 30 feet)							
	PFOS	ND	0.126	mg/kg	2/0	No		
	PFOA	ND	0.126	mg/kg	2/0	No		
	PFBS	ND	130	mg/kg	2/0	No		
AFFF Release Area 11 Active FTA	Surface Soil (0 to 0.5 feet)						No	Advance Area to RI
	PFOS	**1.1**	0.126	mg/kg	3/2	**Yes**		
	PFOA	0.011	0.126	mg/kg	3/0	No		
	PFBS	ND	130	mg/kg	3/0	No		
	Subsurface Soil (23 to 25 feet)							
	PFOS	0.00063 B	0.126	mg/kg	3/0	No		
	PFOA	ND	0.126	mg/kg	3/0	No		
	PFBS	ND	130	mg/kg	3/0	No		
AFFF Release Area 12 Perimeter Road Fuel Spill	Subsurface Soil (8 to 30 feet)						No	NFRAP
	PFOS	ND	0.126	mg/kg	2/0	No		
	PFOA	ND	0.126	mg/kg	2/0	No		
	PFBS	ND	130	mg/kg	2/0	No		
AFFF Release Area 14 Basewide Groundwater	Groundwater						Yes	Initiate Expanded SI Advance Area to RI
	PFOS	**24**	0.07	µg/L	20/7	**Yes**		
	PFOA	**3.1**	0.07	µg/L	20/6	**Yes**		
	PFOS+PFOA	**26.2**	0.07	µg/L	20/7	**Yes**		
	PFBS	0.84	400	µg/L	20/0	No		

Notes:

* includes normal and field duplicate samples (count does not include QC samples)

AFFF – aqueous film forming foam

B - The analyte was identified in an associated blank as well as the sample

bgs – below ground surface

DW – Drinking Water

J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample

µg/L - micrograms per liter
mg/kg - milligrams per kilogram
ND – not detected
RI – Remedial Investigation
NFRAP – No Further Remedial Action Planned
PFBS – perfluorobutanesulfonic acid
PFOS – perfluorooctanesulfonic acid
PFOA – perfluorooctanoic acid
Q = The analyte is both B-qualified because of blank detection and J-qualified because of an additional QC issue

Potential human health pathways were identified and detailed in Section 4 of this SIR. The potential receptors vary by AFFF release area. Media-specific pathways and receptors are discussed below.

Surface and Subsurface Soil Receptors

Potentially complete soil exposure pathways exist at AFFF release areas 2, 3, 4, 5, 9, and 11. Potential human exposure receptors from PFOS and PFOA in surface and subsurface soil include USAF personnel, contract personnel, grounds maintenance workers, utility workers, construction workers, and visitors. Surface soil is a possible exposure point for on-site workers and site visitors, at AFFF release areas 2, 3, 4, 5, 9, and 11 and subsurface soil is a possible exposure point primarily for on-site workers involved in excavation, digging, and other activities that expose soil below ground surface at AFFF Release Area 5. The highest potential for exposure to PFOS and PFOA from soil is to on-site workers that may be involved with excavation or drilling activities. Based on the SI, potential complete pathways for human exposure to PFAS-impacted surface and subsurface soil were identified.

Groundwater Receptors

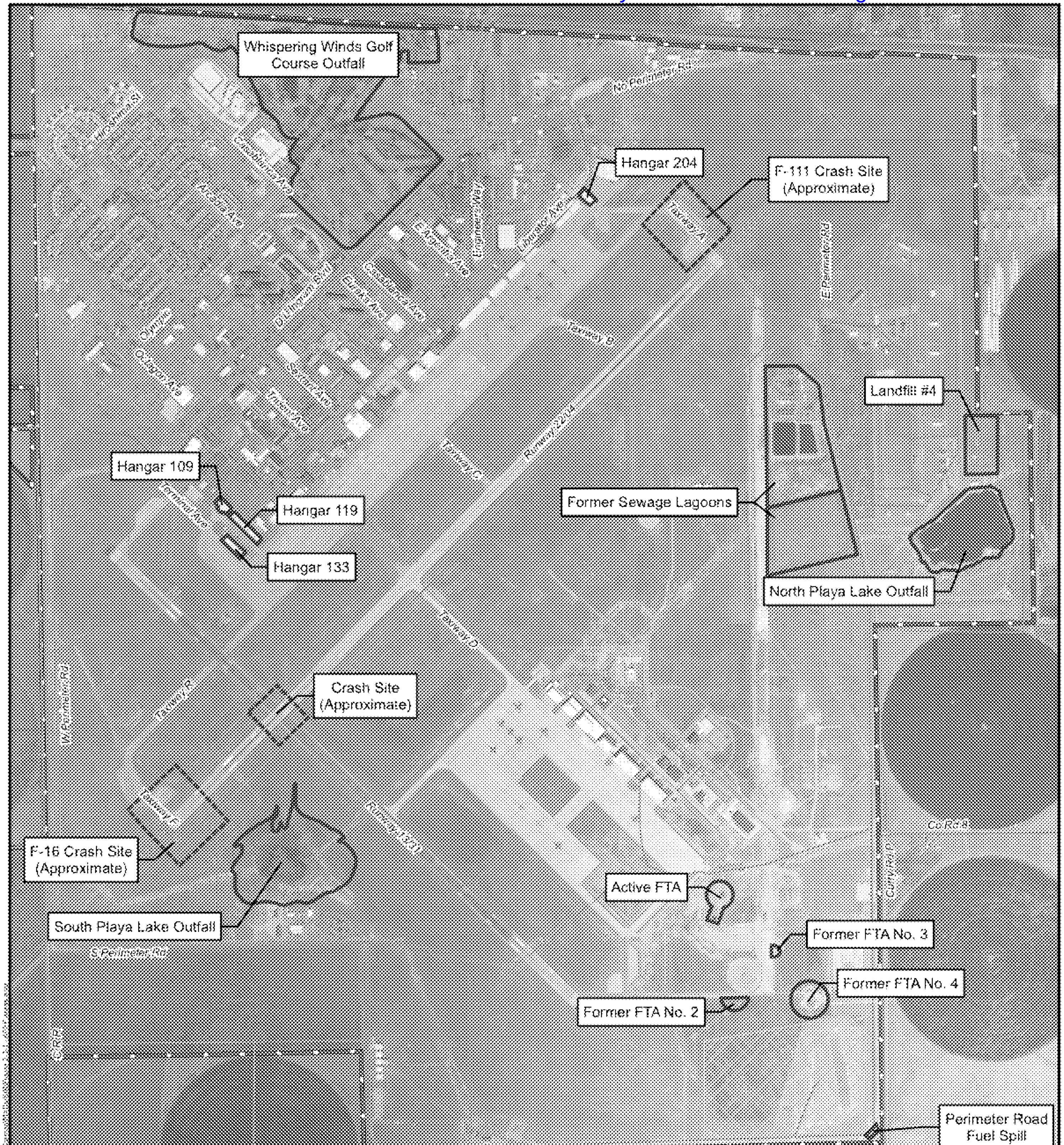
Potential human exposure receptors of PFAS in groundwater via the ingestion pathway include residents of properties downgradient of identified groundwater release areas that currently obtain drinking water from private (domestic or domestic and livestock) water supply wells. As a result, there is currently a potential receptor pathway with immediate impacts to human health at Cannon AFB.

Sediment Receptors

PFOS was detected in sediments collected at AFFF release areas 6 and 8 at concentrations below the calculated RSL. Potential exposure receptors include USAF personnel, contract personnel, grounds maintenance workers, utility workers, construction workers, and visitors that may come into contact with sediment at these AFFF release areas.

Surface Water Receptors

PFOS and/or PFOS+PFOA were detected/calculated in surface water at concentrations exceeding HA value of 0.07 µg/L at AFFF Release Area 6, and below the HA at AFFF Release Area 8. Potential exposure receptors include USAF personnel and residents, grounds maintenance workers, utility workers, construction workers, and site visitors that may come in contact with surface water at AFFF Release Areas 6 and 8.



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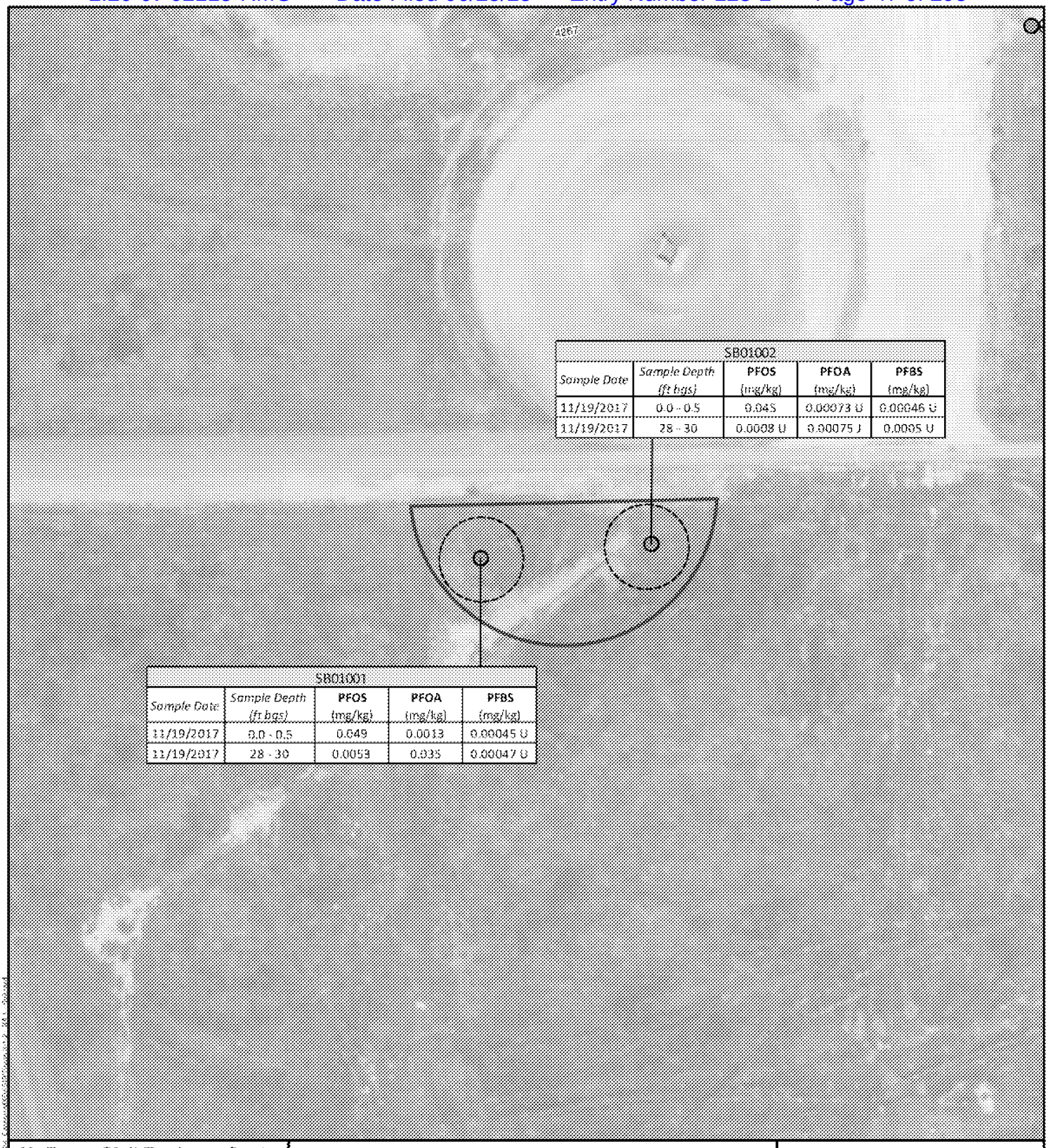
0 500 1,000 2,000 Feet

Symbol Key

- Roads
- AFFF Release Area
- AFFF Release Area (Approximate)
- Cannon AFB Installation Boundary
- Landfill 5 Area

Figure 2.3-1
AFFF Release Areas
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report



SB01002				
Sample Date	*Sample Depth (ft bgs)*	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/19/2017	0.0 - 0.5	0.045	0.00073 U	0.00046 U
11/19/2017	28 - 30	0.0008 U	0.00075 J	0.0005 U

SB01001				
Sample Date	*Sample Depth (ft bgs)*	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/19/2017	0.0 - 0.5	0.049	0.0013	0.00045 U
11/19/2017	28 - 30	0.0053	0.035	0.00047 U

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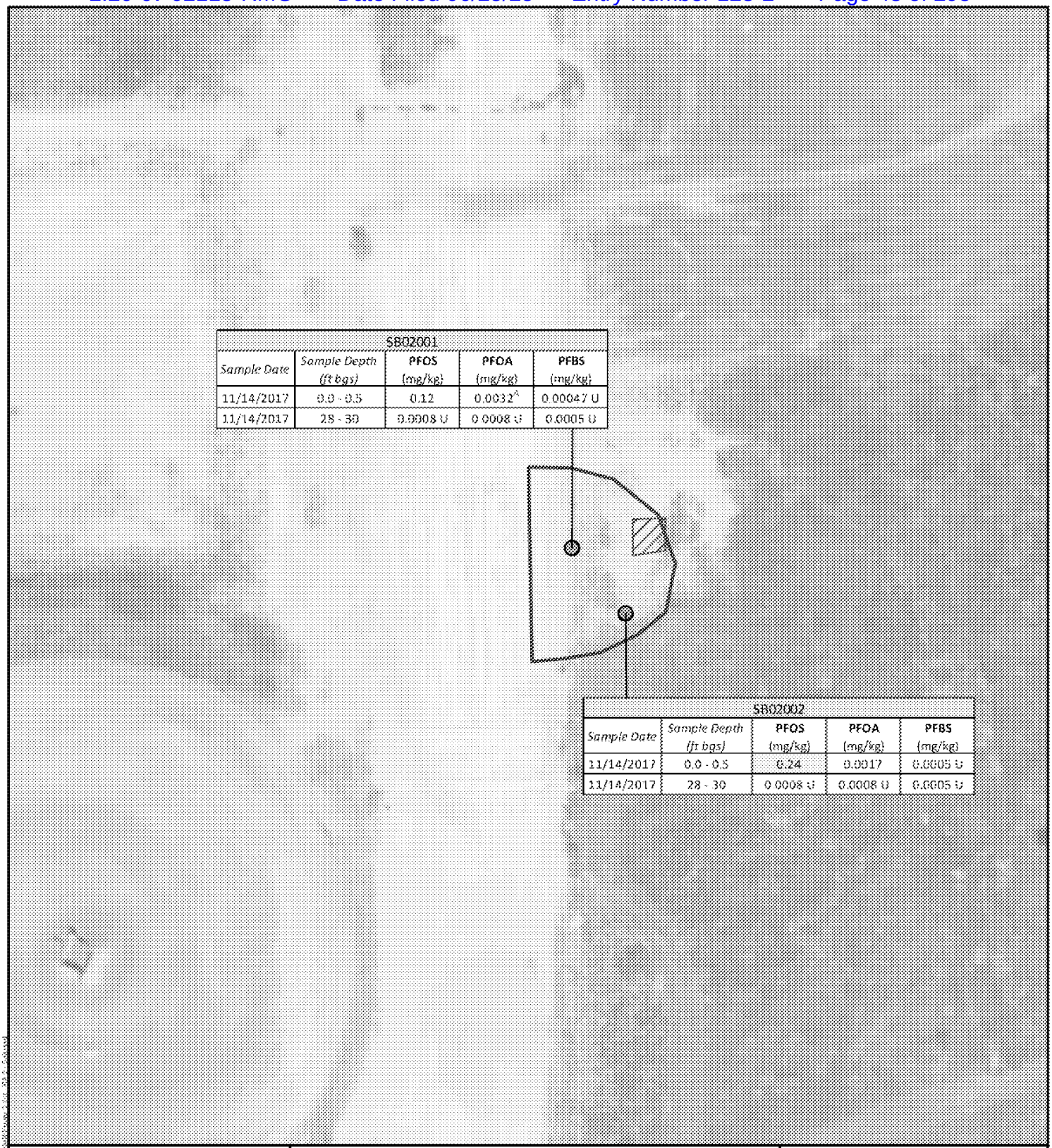
0 50 100 200 Feet

Symbol Key

- Soil Boring
- Historic Features
- AFFF Release Area

FIGURE 3.1-2
PFAS in Soil
Former FTA No. 2
AFFF Release Area 1
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide Site Inspection Report



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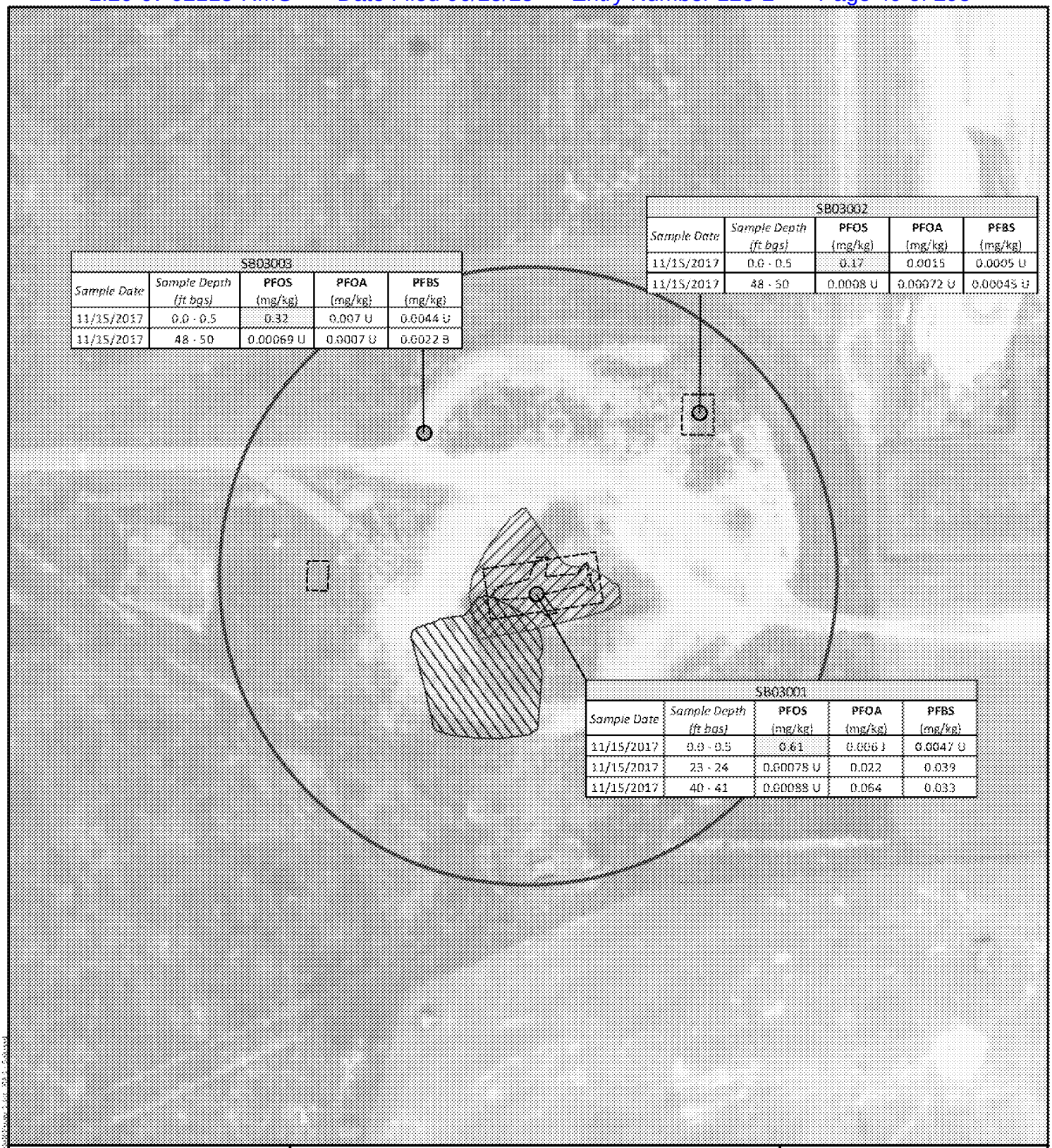
0 25 50 100 150 Feet

Symbol Key

- Soil Boring
- AFFF Release Area
- 2013 Excavation Area

FIGURE 3.2-2
PFAS in Soil
Former FTA No. 3
AFFF Release Area 2
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide Site Inspection Report



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0 25 50 100 150 Feet

Symbol Key

- Soil Boring
- Historic Features
- AFFF Release
- Limits of 2005 Excavation
- Limits of 2009 Excavation

FIGURE 3.3-2
PFAS in Soil
Former FTA No. 4
AFFF Release Area 3
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
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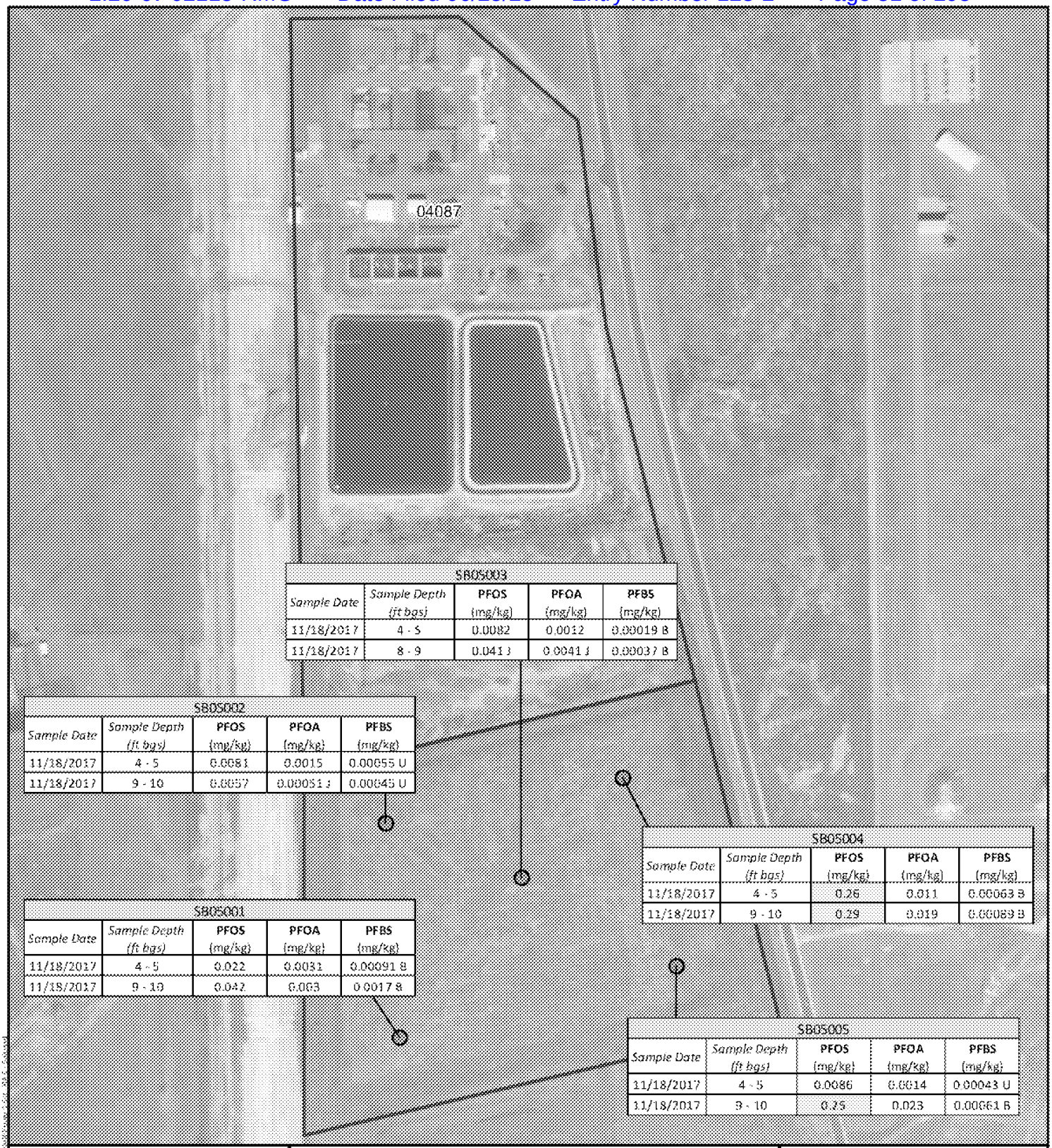
0 25 50 100 150 Feet

Symbol Key

- Soil Boring
- AFFF Release

FIGURE 3.4-2
PFAS in Soil
Hangars 119 and 133
AFFF Release Area 4
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report



SB05003

Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/18/2017	4 - 5	0.0082	0.0012	0.00019 B
11/18/2017	8 - 9	0.041 J	0.0041 J	0.00037 B

SB05002

Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/18/2017	4 - 5	0.0081	0.0015	0.00055 U
11/18/2017	9 - 10	0.0057	0.00051 J	0.00045 U

SB05004

Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/18/2017	4 - 5	0.26	0.011	0.00063 B
11/18/2017	9 - 10	0.29	0.019	0.00089 B

SB05001

Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/18/2017	4 - 5	0.022	0.0031	0.00091 B
11/18/2017	9 - 10	0.042	0.003	0.0017 B

SB05005

Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/18/2017	4 - 5	0.0086	0.0014	0.00043 U
11/18/2017	9 - 10	0.25	0.023	0.00061 B

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0 100 200 400 Feet

Symbol Key

- Soil Boring
- Water Line
- AFFF Release Area

FIGURE 3.5-2
PFAS in Soil
Former Sewage Lagoons
AFFF Release Area 5
Cannon Air Force Base
Clovis, New Mexico

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0 100 200 400 Feet

Symbol Key

- Sediment Sample
- AFFF Release Area
- Cannon AFB Installation Boundary

FIGURE 3.6-2
PFAS in Sediment
North Playa Lake Outfall
AFFF Release Area 6
Cannon Air Force Base
Clovis, New Mexico

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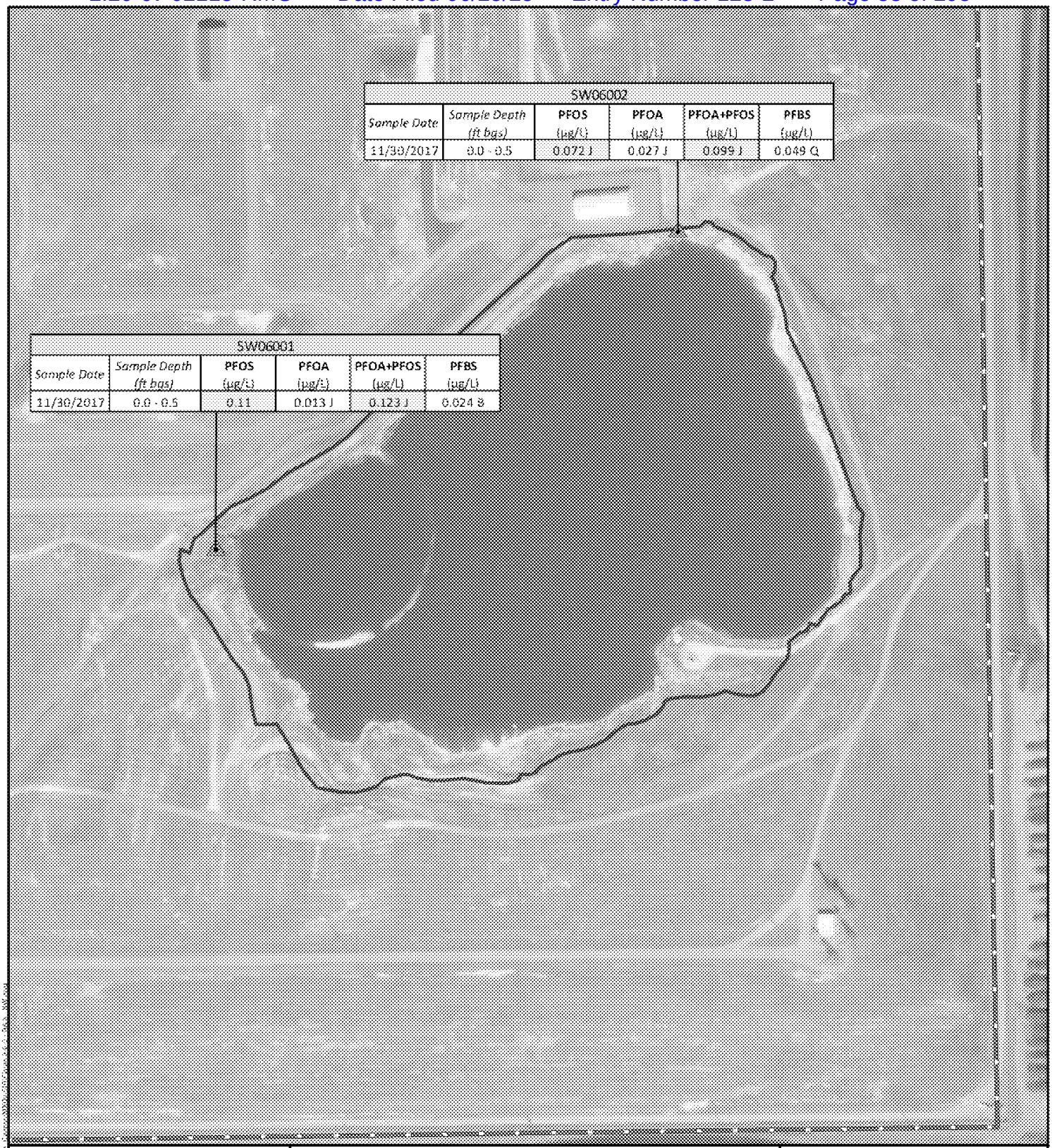
Environmental Programs Worldwide
Site Inspection Report



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0 100 200 400 Feet

Symbol Key

- Surface Water Sample
- AFFF Release Area
- Cannon AFB Installation Boundary

FIGURE 3.6-3
PFAS in Surface Water
North Playa Lake Outfall
AFFF Release Area 6
Cannon Air Force Base
Clovis, New Mexico

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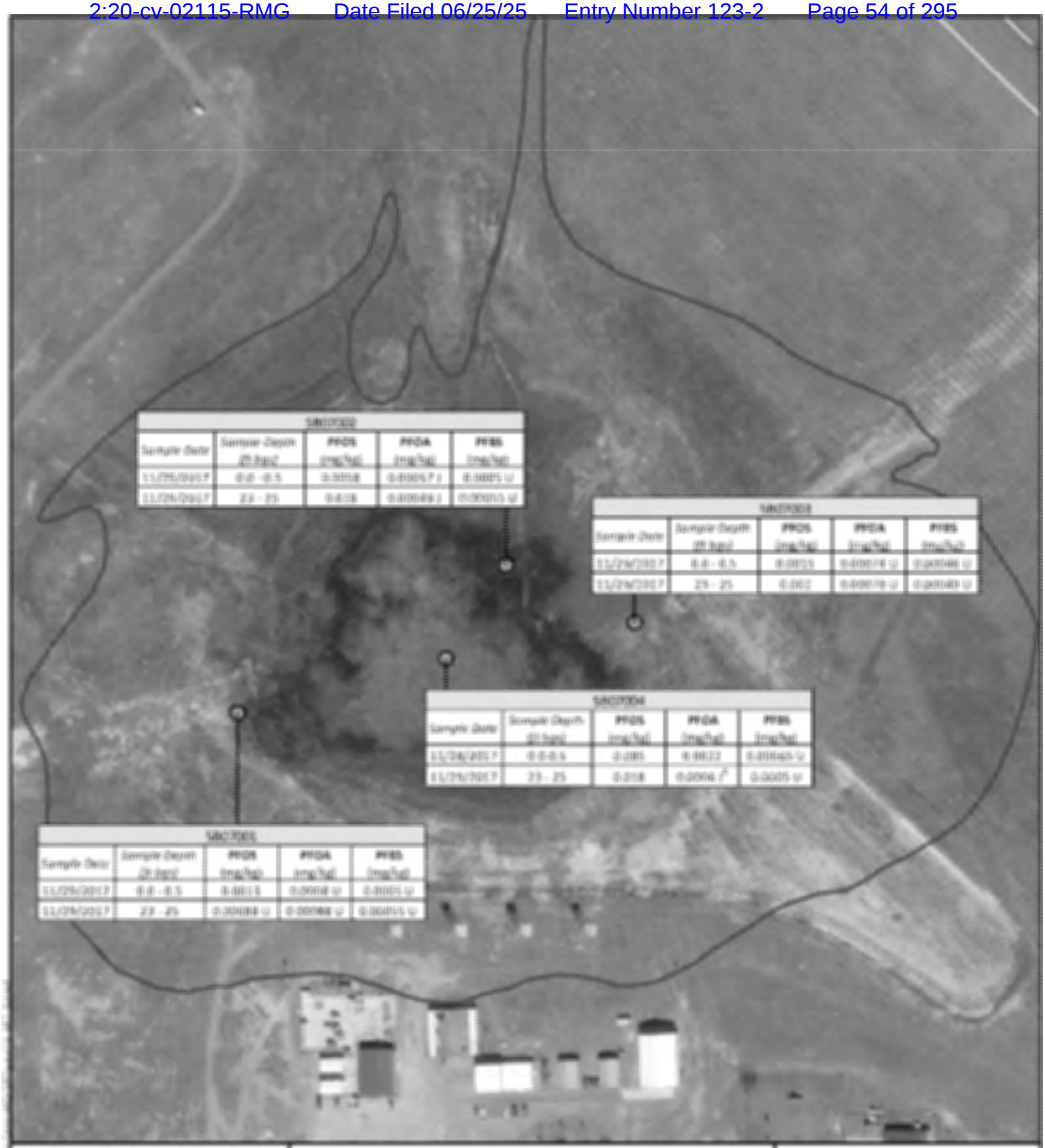

SB07002				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/29/2017	0.0 - 0.5	0.0058	0.00057 J	0.0085 U
11/29/2017	2.5 - 25	0.038	0.00084 J	0.00055 U

SB07003				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/29/2017	0.0 - 0.5	0.0015	0.00074 U	0.00046 U
11/29/2017	2.5 - 25	0.062	0.00078 U	0.00049 U

SB07004				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/29/2017	0.0-0.5	0.085	0.0022	0.00045 U
11/29/2017	2.5 - 25	0.018	0.0004 J	0.0035 U

SB07005				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/29/2017	0.0 - 0.5	0.0013	0.0008 U	0.0005 U
11/29/2017	2.5 - 25	0.00088 U	0.00088 U	0.00055 U

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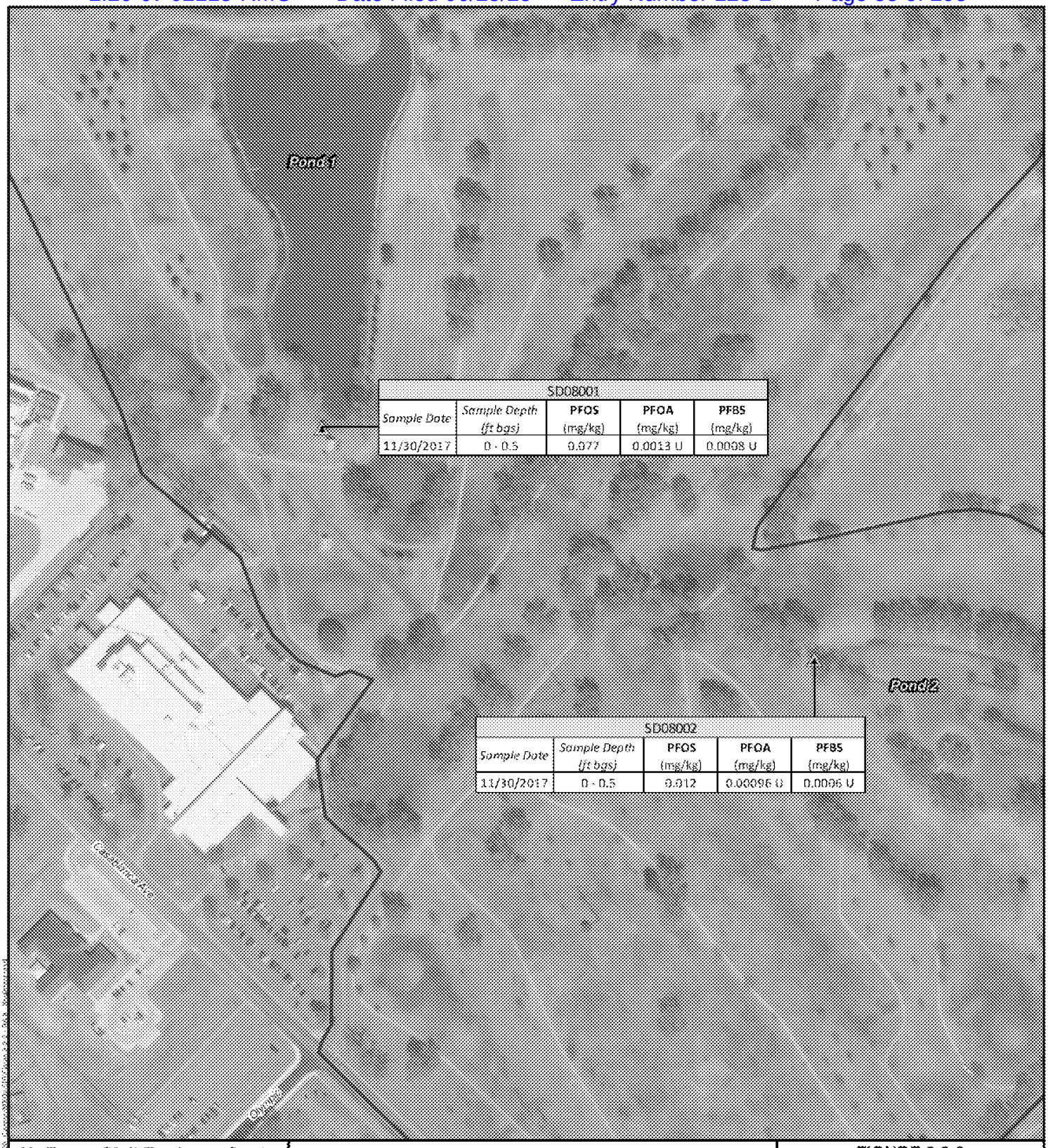
0 50 100 200 Feet

Symbol Key

- Soil Boring
- AFFF Release Area

FIGURE 3.7-2
PFAS in Soil
South Playa Lake Outfall
AFFF Release Area 7
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report



SD08001				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/30/2017	0 - 0.5	0.077	0.0013 U	0.0008 U

SD08002				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/30/2017	0 - 0.5	0.012	0.00096 U	0.0006 U

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0 100 200 400 Feet

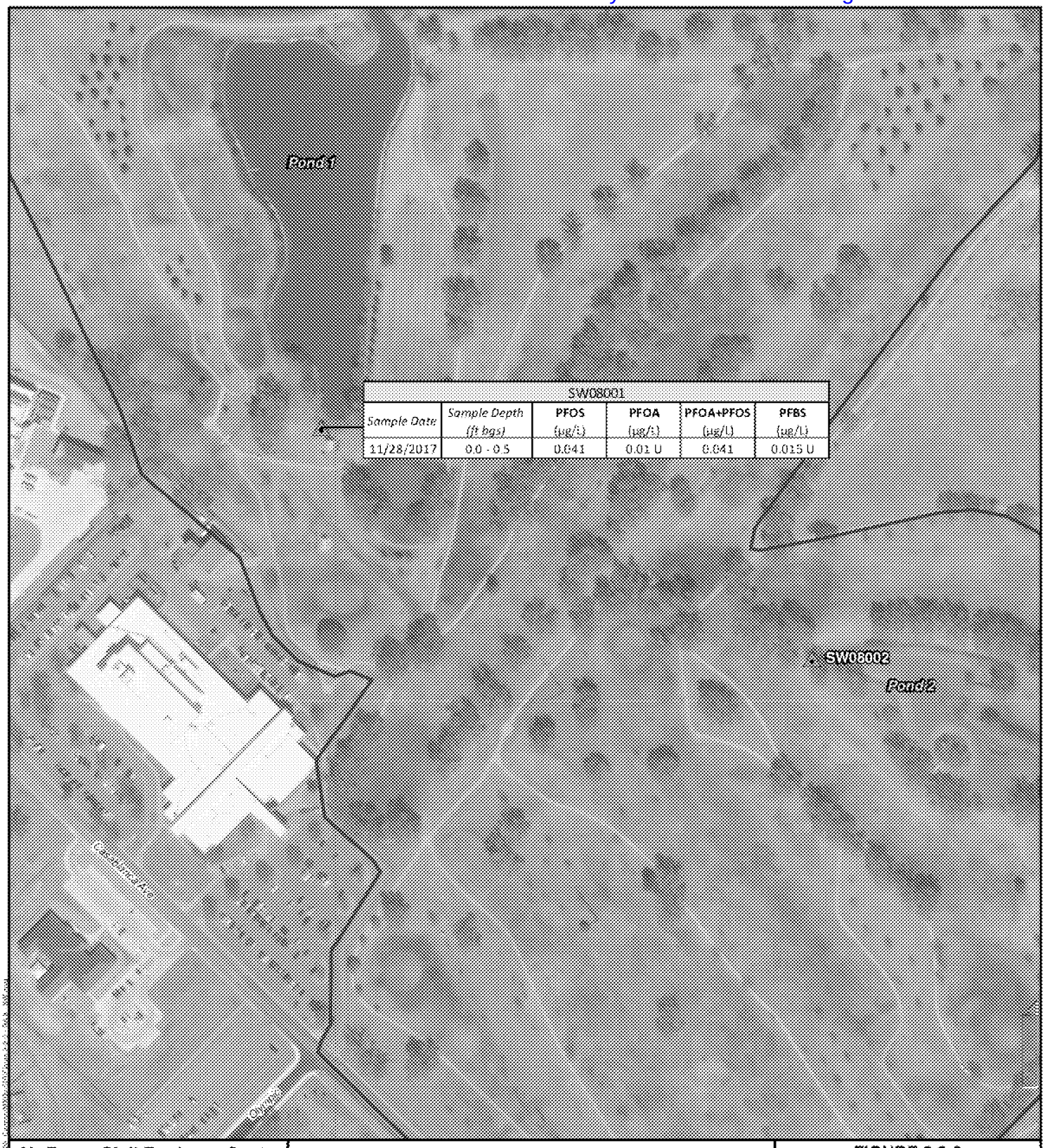
Symbol Key

Sediment Sample

AFFF Release

FIGURE 3.8-2
PFAS in Sediment
Whispering Winds Golf Course Outfall
AFFF Release Area 8
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report



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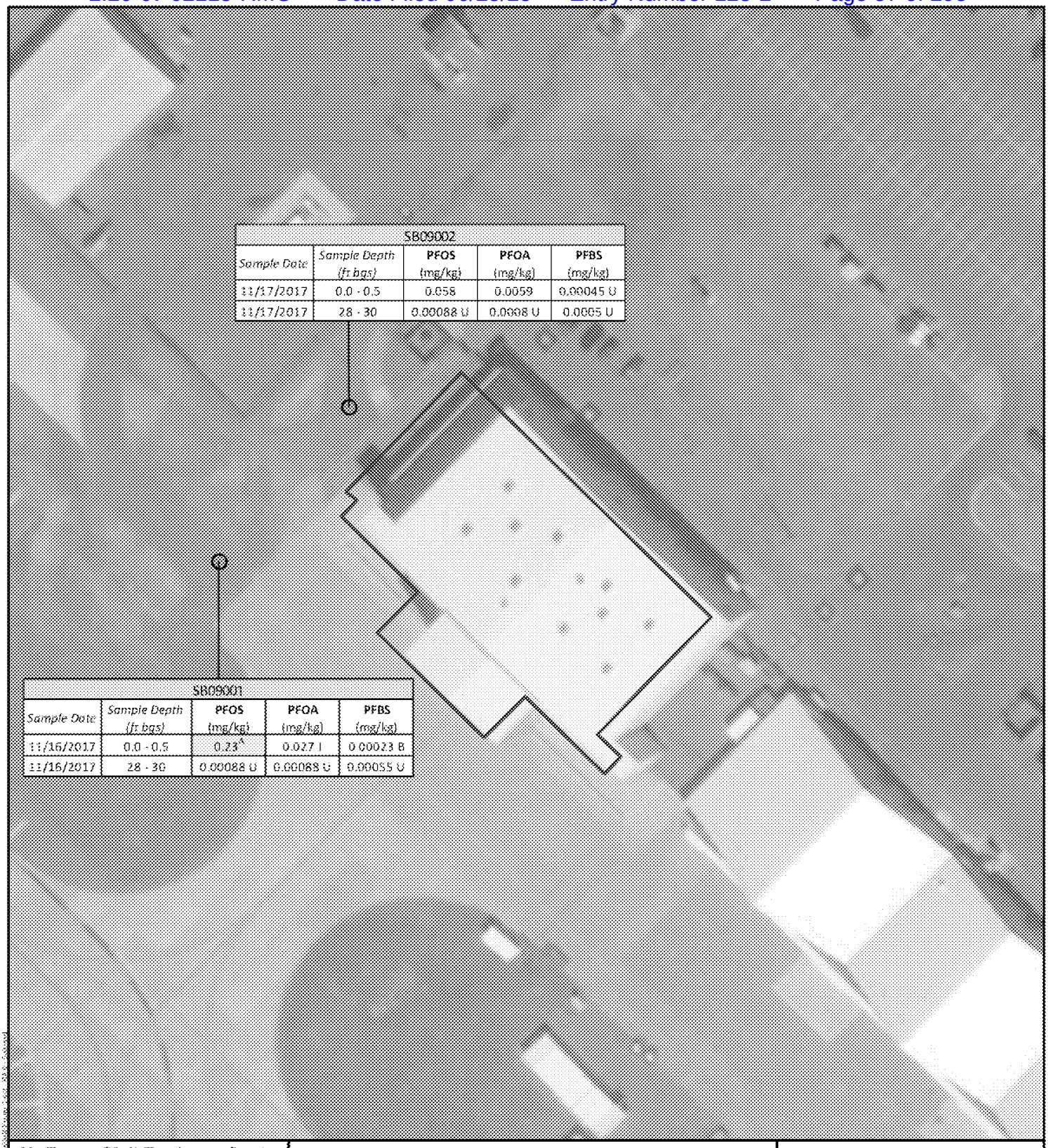
0 100 200 400 Feet

Symbol Key

- Surface Water Sample
- AFFF Release

FIGURE 3.8-3
PFAS in Surface Water
Whispering Winds Golf Course Outfall
AFFF Release Area 8
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report



SB09002				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/17/2017	0.0 - 0.5	0.058	0.0059	0.00045 U
11/17/2017	28 - 30	0.00088 U	0.0008 U	0.0005 U

SB09001				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/16/2017	0.0 - 0.5	0.23 A	0.027 I	0.00023 B
11/16/2017	28 - 30	0.00088 U	0.00088 U	0.00055 U

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0 25 50 100 Feet

Symbol Key

- Soil Boring
- AFFF Release Area

FIGURE 3.9-2
PFAS in Soil
Hangar 109
AFFF Release Area 9
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

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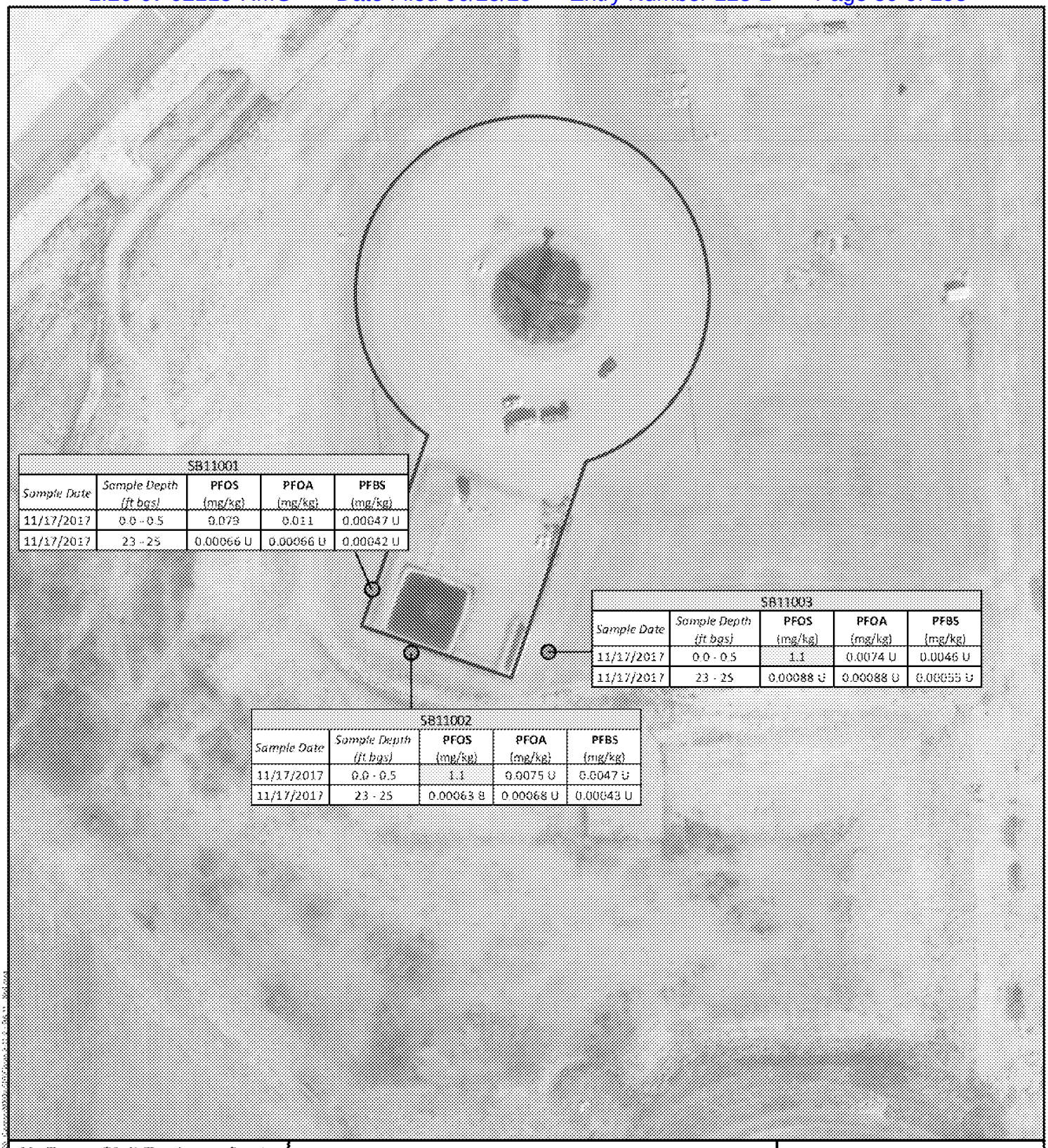
0 50 100 200 Feet

Symbol Key

- Monitoring Well
- AFFF Release
- Landfill
- Cannon AFB Installation Boundary

FIGURE 3.10-2
PFAS in Groundwater
Landfill #4
AFFF Release Area 10
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report



SB11001				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/17/2017	0.0 - 0.5	0.079	0.011	0.00047 U
11/17/2017	23 - 25	0.00066 U	0.00066 U	0.00042 U

SB11003				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/17/2017	0.0 - 0.5	1.1	0.0074 U	0.0046 U
11/17/2017	23 - 25	0.00088 U	0.00088 U	0.00055 U

SB11002				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/17/2017	0.0 - 0.5	1.1	0.0075 U	0.0047 U
11/17/2017	23 - 25	0.00063 B	0.00068 U	0.00043 U

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0 50 100 200 Feet

Symbol Key

- Soil Boring
- AFFF Release

FIGURE 3.11-2
PFAS in Soil
Active FTA
AFFF Release Area 11
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

SB12001				
Sample Date	Sample Depth (ft bgs)	PFOS (mg/kg)	PFOA (mg/kg)	PFBS (mg/kg)
11/18/2017	8 - 10	0.00069 U	0.00069 U	0.00043 U
11/18/2017	28 - 30	0.00077 U	0.00077U	0.00048 U

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By: M.Vavra | Date: 4/25/2018

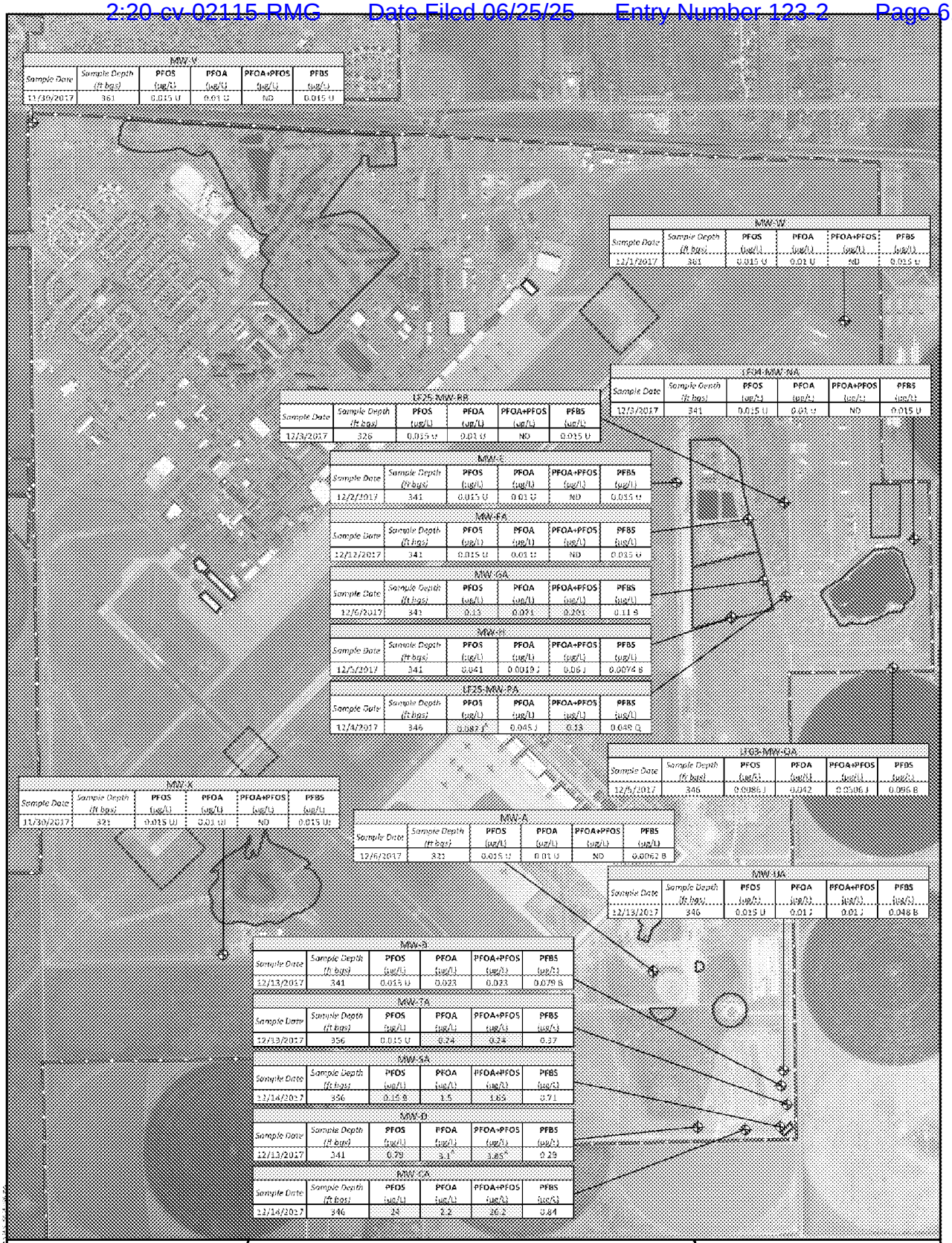
0 50 100 200 Feet

Symbol Key

- Soil Boring
- AFFF Release Area
- Landfill 5 Area
- Cannon AFB Installation Boundary

FIGURE 3.12-2
PFAS in Soil
Perimeter Road Fuel Spill
AFFF Release Area 12
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report



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0 500 1,000 2,000 Feet

Symbol Key

- Monitoring Well
- AFFF Release Area
- AFFF Release Area (Approximate)
- Cannon AFB Installation Boundary

FIGURE 3.14-2
PFAS in Groundwater
Basewide Groundwater Sampling
AFFF Release Area 14
Cannon Air Force Base
Clovis, New Mexico

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Environmental Programs Worldwide
Site Inspection Report

Exhibit 2

FINAL
PRELIMINARY ASSESSMENT REPORT FOR PERFLUORINATED COMPOUNDS AT CANNON AIR FORCE BASE, NEW MEXICO

Prepared for:

Air Force Civil Engineer Center
2261 Hughes Avenue, Suite 155
Lackland AFB, Texas 78236-9853

Contract No. FA8903-08-D-8772
Task Order 0065
CDRL A001A

October 2015

FINAL
PRELIMINARY ASSESSMENT REPORT
FOR PERFLUORINATED COMPOUNDS
CANNON AIR FORCE BASE, NEW MEXICO

1.0 INTRODUCTION

HydroGeoLogic, Inc. (HGL) has been contracted by the Air Force Civil Engineer Center to perform preliminary assessment (PA) activities at multiple U.S. Air Force (Air Force) and Air National Guard Fire Training Areas (FTAs) and Non-FTAs to determine locations of potential environmental release of perfluorinated compounds (PFCs). Specifically, the HGL Team is to complete PA activities to determine potential releases of PFCs at 82 Air Force and Air National Guard installations from FTAs and other known and suspected releases of PFCs from Aqueous Film Forming Foam (AFFF) usage or storage areas. The work is being performed by HGL under the existing 4P Architecture and Engineering contract, Contract No. FA8903-08-D-8772, Task Order 0065.

HGL conducted activities associated with this PA at Cannon Air Force Base (AFB) during the week of July 5, 2015, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 Preliminary Assessment processes. Cannon AFB is an active military installation located in Curry County, New Mexico, as presented in Figure 1.1.

Cannon AFB dates to 1929 when Portair Field was established as a civilian passenger terminal. In 1942, the Army Air Corps took control of the civilian airfield and it became known as the Clovis Army Air Base. In early 1945, the base was renamed Clovis Army Air Field, where flying, bombing, and gunnery classes continued until the base was deactivated in May 1947. The base was reassigned to the Tactical Air Command and formally reactivated as Clovis AFB in 1951. It was renamed Cannon AFB in 1957. Several Fighter-Bomber Groups and Tactical Fighter Wings have occupied the Base since 1951 (Cannon AFB, 2005).

1.1 BACKGROUND

PFCs are compounds used in the formulation of AFFF, which the Air Force has used in fire training exercises, suppressing aircraft and other vehicle fires, and in aircraft hangar fire suppression systems. Although PFCs are not regulated under CERCLA or the Resource Conservation and Recovery Act (RCRA), there is evidence that pefluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), which can be found in the environment following AFFF release, may present potential, non-carcinogenic risks to human health and the environment (Chang et al., 2014; Porter, 2011; Rak et al., 2009).

Several federal government documents confirm the initial use of AFFF by the Air Force beginning in 1970:

- MILSpec for AFFF (MIL-F-24385) formally issued in 1969.

- General Accounting Office determination on sole source award protest to provide AFFF to the Navy in December 1969.
- A History of Fire Protection Training at Chanute AFB, 1964-1976 (Coates, 1977).

Based on Air Force performance testing results on AFFF, the Air Force Director of Civil Engineering, M.G. Goddard, in 1970 issued authorization for the Air Force to procure AFFF. No usage within the Air Force is documented or suspected prior to 1970.

1.2 PURPOSE AND OBJECTIVES

The purpose and objective of this PA report is to identify locations at Cannon AFB where PFCs may have been released to the environment and to conduct an initial assessment of possible migration pathways and receptors of potential contamination.

This PA report documents the known FTAs, as well as additional locations (non-FTAs) where AFFF may have been released into the environment at Cannon AFB (Table 1.1). Locations that are considered non-FTAs include but are not limited to hangars, fire stations, emergency response areas and any other locations where the potential exists for AFFF to have been released into the environment. This PA report also differentiates locations that pose little or no potential threat to human health and the environment from locations that warrant further investigation.

Table 1.1
FTAs and Non-FTAs Identified for Potential AFFF Releases

Fire Training Areas
Former FTA No. 1 (FT-06)
Former FTA No. 2 (FT-07)
Former FTA No. 3 (FT-08)
Former FTA No. 4 (FTA-4)
Active FTA
Non-Fire Training Areas
Hangars
Hangar 109
Hangar 119
Hangar 125
Hangar 126
Hangar 133
Hangar 197
Hangar 199
Hangar 204
Hangar 208
Fire Stations
Current Fire Station
Former Fire Station
Other
Former Sewage Lagoons
North Playa Lake Outfall
South Playa Lake Outfall
Whispering Winds Golf Course Outfall

4.0 SUMMARY AND CONCLUSIONS

4.1 SUMMARY

4.1.1 Fire Training Areas

4.1.1.1 Former Fire Training Areas

There are four former FTAs present at Cannon AFB: FT-06, FT-07, FT-08, and FTA-4. The oldest FTA, FT-06, ceased operating before initial use of AFFF by the Air Force in 1970. FT-07, FT-08, and FTA-4 were all operational during or after 1970, and the Cannon AFB Fire Department likely used AFFF at those FTAs during fire training exercises. The exact quantity of AFFF used at the former FTAs is unknown. However, the exercise areas and runoff pits at the former FTAs were all unlined. As such, any substances used there would have likely permeated into the soil. Several investigations and remedial actions have occurred at the former FTAs, but none have focused on AFFF or PFCs.

There is a potential for PFC contamination to the environmental media at FT-07, FT-08, and FTA-4.

4.1.1.2 Active Fire Training Area

Cannon AFB currently has one operating FTA with a lined burn pit, a mock aircraft, a propane fuel tank, a control tower, and a lined evaporation pond. The burn pit is used for monthly aircraft fire response training as well as annual vehicle foam spray tests. The amount of AFFF used at the active FTA varies depending on the exercise or vehicle being tested. Typically, AFFF is sprayed from vehicles into the burn pit until there is a consistent spray pattern. Liquids discharged into the burn pit, including water and AFFF, drain to a lined evaporation pond at the FTA. There was no available documentation or evidence of a release of AFFF to the environment from the lined containment system at the time of the assessment.

4.1.2 Non-Fire Training Areas

4.1.2.1 Hangars

There are nine hangars at Cannon AFB that are equipped with (or have previously been equipped with) AFFF fire suppression systems. There are documented releases of AFFF at all nine of these hangars. However, most of the AFFF releases entered floor trenches in hangar bays or storm drains on the concrete aprons near the hangars. Floor trenches in hangar bays connect to the sanitary sewer system and routed to the former sewage lagoons prior to the construction of the WWTP in 1998. Any liquid that has entered the floor trenches after 1998 has been routed to the WWTP. The storm drains outside of the hangars connect directly to South Playa Lake, the base's primary stormwater outfall. With the exception of one event, all releases of AFFF at these hangars entered the sanitary sewer system or stormwater drainage system.

Records show that a release of AFFF in July 2001 at Hangar 133 was washed to nearby soil and may have been released to the environment. Likewise, three separate discharges of AFFF at

Hangars 119 and 204 from May 2002 to July 2013 may have been left uncontained on nearby asphalt or concrete flight ramps. As such, AFFF may have permeated soil near Hangars 119 and 204 and been released to the environment.

With the exception of Hangars 119, 133, and 204, the environmental media at the hangars summarized in Section 3.1 have not been impacted by PFCs.

4.1.2.2 Fire Stations

Cannon AFB has one active fire station with vehicles and trailers that contain AFFF. A bench stock supply of AFFF is regularly stored on the stall floors and in a supply closet near the stalls with spill-containment mechanisms in place. Daily operational checks, monthly time and distance testing, and hose washouts for all firefighting vehicles at the current fire station are conducted on the concrete ramp north of the fire station using water. Annual foam checks for vehicles stored at the station are conducted at the active FTA. Refilling activities for AFFF are conducted in station stalls using dedicated transfer pumps.

The former fire station, which operated until 2005, had nearly identical procedures to the active fire station. However, AFFF was stored in an outdoor closet. The former fire station also had an OWS that connected to the sanitary sewer system.

There was no available documentation or evidence to suggest that the environmental media surrounding the current or former fire stations were impacted by PFCs.

4.1.2.3 Emergency Response

According to a records query and personal interviews, the Cannon AFB Fire Department has not responded to any fire emergencies requiring the application of AFFF to suppress fires.

4.1.2.4 Other

Currently, there is no accepted wastewater treatment process for AFFF. Any wastewater collected at the WWTP containing AFFF would have been passed on to the discharge locations associated with the WWTP. Both of the outfall discharge locations (North Playa Lake and the golf course) have the potential to have released AFFF.

Prior to the WWTP construction in 1998, wastewater generated at Cannon AFB was discharged directly to the former sewage lagoons. Currently, effluent from the WWTP is discharged primarily into North Playa Lake with a portion also being discharged to the Whispering Winds Golf Course for distribution throughout the golf course. All areas are potential AFFF release locations.

Additionally, South Playa Lake has received stormwater runoff from portions of the flightline area since 1943. Solvents, fuels, oils, greases, and AFFF are all potential contaminants that would have discharged to the lake from the flightline area.

The potential exists for PFC contamination to the environmental media at the former Sewage Lagoons, North Playa Lake Outfall, South Playa Lake Outfall, and the Whispering Winds Golf Course Outfall.

4.2 CONCLUSIONS

Table 4.1 summarizes the findings from this PA report and presents possible future location management decisions. The identified locations are categorized by "group" in Table 4.1 as follows:

- Group 1 – High mass of AFFF released and probability of groundwater contamination.
- Group 2 – Unknown mass or medium mass of AFFF released.
- Group 3 – Low mass of AFFF released.
- Group 4 – No AFFF released.

Based on the "group" designation and rationale for each location, recommendations are provided in Table 4.1. In accordance with the EPA CERCLA Preliminary Assessment and Site Inspections Guidance documents, each of the identified locations is either recommended for: Implement removal action due to imminent threat; close out of location due to no release; Initiate a Remedial Investigation; or Initiate a Site Inspection.

- Removal action, as defined in CERCLA Section 104, are actions taken to eliminate, control, or otherwise mitigate a threat posed to public health or the environment due to a release or threatened release of hazardous substances (USEPA, 1991).
- Close out or no further remedial action planned is defined as a site disposition decision that further response under the Federal Superfund is not necessary (USEPA, 1991).
- Remedial Investigation is defined as a field investigation to characterize the nature and extent of contamination at a site. The Remedial Investigation supports development, evaluation, and selection of the appropriate response alternative (USEPA, 1991).
- Site Inspection is defined as an investigation to collect and analyze waste and environmental samples to support a site evaluation (USEPA, 1992).

Table 4.1
Preliminary Assessment Report Summary and Findings

Locations	Group	Rationale	Recommendation
Former FTA No. 1 (FT-06)	Group 4	• Operated from approximately 1959 to 1968. • Fire training activities conducted on unlined burn pit. • Ceased operations before initial use of AFFF by the Air Force in 1970.	Close-out with no additional investigation.
Former FTA No. 2 (FT-07)	Group 2	• Operated from 1968 to 1974. • JP-4 was the only fuel burned at this site, with approximately 300 gallons used per exercise (twice per quarter). • Exercises were conducted at two unlined depressions. • No specific records of AFFF use at FT-07, but the area was operational after initial use of AFFF by the Air Force in 1970. • Records show that FTA procedures at Cannon AFB since approximately 1970 have been to "extinguish with AFFF."	Initiate a Site Inspection.
Former FTA No. 3 (FT-08)	Group 2	• Operated from 1968 to 1974. • JP-4 was the only fuel burned at this site, with approximately 300 gallons used per exercise (twice per quarter). • Exercise area was unlined. • No specific records of AFFF use at FT-08, but the area was operational after initial use of AFFF by the Air Force in 1970. • Records show that FTA procedures at Cannon AFB since approximately 1970 have been to "extinguish with AFFF."	Initiate a Site Inspection.
Former FTA No. 4 (FTA-4)	Group 2	• Operated from approximately 1974 to 1995. • Exercises were conducted twice per quarter using commingled waste oils, solvents, and recovered JP-4 fuel. • Prior to 1985, runoff generated during exercises at FTA-4 collected in an unlined pit. • The unlined pit was backfilled in 1985 and a new, lined pit with an OWS was installed to handle collected runoff. • No specific records of AFFF use at FTA-4, but the area was operational after initial use of AFFF by the Air Force in 1970. • Records show that FTA procedures at Cannon AFB since approximately 1970 have been to "extinguish with AFFF."	Initiate a Site Inspection.
Active FTA	Group 4	• Fire training activities conducted on lined burn pit which drains to a lined evaporation pond. • AFFF use at the Active FTA is contained with no release. • No reported or documented release of AFFF.	Close-out with no additional investigation.

Table 4.1 (Continued)
Preliminary Assessment Report Summary and Findings

Locations	Group	Rationale	Recommendation
Hangars Never Equipped with AFFF	Group 4	• Hangars 173, 174, 194, 195, 196, 4605, 4606, 4607, 4608, 4609, and 4610 have never been equipped with AFFF fire suppression systems. • Hangars are currently equipped with HEF and/or wet sprinkler systems. • No reported or documented release of AFFF at these hangars.	Close-out with no additional investigation.
Hangar 109	Group 4	• Hangar presently equipped with AFFF. • AFFF discharge would be captured by a floor trench in hangar bay or by a storm drain on the concrete ramp outside of the hangar. • In December 2009, an AFFF release was captured by a floor trench and routed to the WWTP via the sewer system.	Close-out with no additional investigation.
Hangar 119	Group 3	• Hangar presently equipped with AFFF. • AFFF discharge would be captured by storm drains on the concrete ramps outside of the hangar. • There are three documented discharges of AFFF: one entered a nearby storm drain and was routed to South Playa Lake, while two (onto nearby asphalt and flight ramp) may have been left to evaporate and left uncontained. • Uncontained discharges of AFFF had the potential to migrate to nearby grassy areas south and southwest of Hangar 119.	Initiate a Site Inspection.
Hangar 125	Group 4	• Hangar presently equipped with AFFF. • AFFF discharge would be captured by a floor trench in hangar bay or by a storm drain on the concrete ramp outside of the hangar. • In September 2002, an AFFF release was captured by a floor trench and routed to the WWTP via the sewer system. • There have been no reported or documented releases of AFFF at the hangar.	Close-out with no additional investigation.
Hangar 126	Group 4	• Hangar presently equipped with AFFF. • AFFF discharge would be captured by a floor trench in hangar bay or by a storm drain on the concrete ramp outside of the hangar. • In November 2000, an AFFF release was captured by a floor trench and routed to the WWTP via the sewer system. • There have been no reported or documented releases of AFFF at the hangar.	Close-out with no additional investigation.
Hangar 133	Group 2	• Hangar presently equipped with AFFF. • AFFF discharge would be captured by a floor trench in hangar bay or by a storm drain on the concrete ramp outside of the hangar. • In July 2001, 200 gallons of AFFF were released, and some was washed to nearby soil.	Initiate a Site Inspection.

Table 4.1 (Continued)
Preliminary Assessment Report Summary and Findings

Locations	Group	Rationale	Recommendation
Hangar 197	Group 4	• Hangar presently equipped with AFFF. • AFFF discharge would be captured by a floor trench in hangar bay or by a storm drain on the concrete ramp outside of the hangar. • Release of AFFF in December 2000 entered a storm drain and would have routed to South Playa Lake. • Release of AFFF in April 2005 may have entered a floor trench and been routed to the WWTP. • There have been no reported or documented releases of AFFF at the hangar.	Close-out with no additional investigation.
Hangar 199	Group 4	• Hangar presently equipped with HEF, but was equipped with AFFF from 1992 to 1999. • AFFF discharge would be captured by a floor trench in hangar bay or by a storm drain on the concrete ramp outside of the hangar. • Three AFFF releases from June 1994 to June 1996 may have entered storm drains or floor trenches and been routed to South Playa Lake or the former sewage lagoons. • There have been no reported or documented releases of AFFF at the hangar.	Close-out with no additional investigation.
Hangar 204	Group 3	• Hangar presently equipped with AFFF. • AFFF discharge would be captured by a floor trench in hangar bay or by a storm drain on the concrete ramp outside of the hangar. • A discharge of AFFF in May 2002 entered the nearby concrete ramp and was reportedly left to evaporate. • Uncontained discharges of AFFF had the potential to migrate to nearby grassy areas south and east of Hangar 204.	Initiate a Site Inspection.
Hangar 208	Group 4	• Hangar presently equipped with HEF, but was equipped with AFFF from 1995 to 2013. • AFFF discharge would be captured by a floor trench in hangar bay or by a storm drain on the concrete ramp outside of the hangar. • Four AFFF releases in 1998 entered the sanitary sewer system and would have been routed to either the former sewage lagoons or the WWTP. • There have been no reported or documented releases of AFFF at the hangar.	Close-out with no additional investigation.
Current Fire Station	Group 4	• Any Time & Distance testing at the station is conducted using water. • Hose wash-outs occur on concrete ramp near station. • Equipment is refilled with AFFF in station stalls. • Stall floor drains connect to sewer system, which drains to WWTP. • Bench stock of AFFF is stored at the station, but secondary containment is in place. • Vehicle/equipment tests using AFFF occur at Active FTA. • No evidence or record of any spill/release of AFFF.	Close-out with no additional investigation.

Table 4.1 (Continued)
Preliminary Assessment Report Summary and Findings

Locations	Group	Rationale	Recommendation
		• No evidence or records of a release of AFFF to the environment.	
Former Fire Station	Group 4	• Any Time & Distance testing at the station was conducted using water. • Equipment was refilled with AFFF in station stalls. • Hose wash-outs occurred in a large closet near station stalls. • Stall floor drain connected to an OWS and eventually the sewer system, which drained to the former sewage lagoons or the WWTP. • Bench stock of AFFF was stored at the station, but it is unclear if secondary containment was in place. • Vehicle/equipment tests using AFFF were conducted at Active FTA. • No evidence or record of any spill/release of AFFF. • No evidence or records of a release of AFFF to the environment.	Close-out with no additional investigation.
Former Sewage Lagoons	Group 2	• Prior to WWTP construction in 1998, all wastewater from Cannon AFB was discharged to these lagoons. • There are documented releases of AFFF to the sanitary sewer system from Hangars 199 and 208 prior to and during 1998.	Initiate a Site Inspection.
North Playa Lake Outfall	Group 2	• Primary discharge point for effluent from WWTP. • Effluent from the WWTP may contain AFFF.	Initiate a Site Inspection.
South Playa Lake Outfall	Group 2	• Primary discharge point for storm drains located near hangars equipped with AFFF. • There is evidence of multiple releases of AFFF into storm drains from hangars.	Initiate a Site Inspection.
Whispering Winds Golf Course Outfall	Group 2	• Beginning in approximately 2002, the golf course began receiving a portion of effluent from the WWTP for irrigation purposes. • Effluent from the WWTP may contain AFFF.	Initiate a Site Inspection.

HGL	Date: 7/9/2015 Time: 8:30am	COMMUNICATION RECORD
Name of Base, State: Cannon AFB, New Mexico		
Interviewer: Ryan McVickers		
Organization: HydroGeoLogic, Inc.		Phone: (602) 476-5303
Position/role on this project: Research Analyst		Email: rmcvickers@hgl.com
Interviewee: Gene Smith		
Organization: 27SOCES/CEIEC		
Position/Job Title: Air Quality Specialist		
How Long in this Postion? - Unknown		
How long at this Base in current and previous positions? – Unknown		
Have you held similar positions at other bases? – No		
Which bases?		
How long?		
Discussion:		

Mr. Smith stated that he is currently the air quality specialist at Cannon AFB and has access to a database documenting several AFFF releases at hangars and other locations around the base. He provided a list of AFFF releases from 1994 to 2015 (attached).

Cannon AFB Hangar/Foam System Inventory

General Hangar Info.						Foam System Info.					HX Hangars Only		
Hangar No.	Year Built	Total Area (Square Ft.)	How many bays?	Current Occupant/Use	Floor trench?	Current Foam System Type	Year current foam system installed	Foam Tank(s) Capacity	Underwing or Overhead Foam System?	Wet-pipe sprinklers installed in bays?	Did HX system replace AFFF system?	If so, from what years did this hangar have an AFFF system?	Miscellaneous Notes
109	1991	20,183	1	27 SO MXS	Yes	AFFF	1991	1400 gal	Underwing	Yes	-		
119	1997	48,000	4	Whs-FSS,CE,SFS,LRS	Yes	AFFF	1997	500 gal	Underwing	Yes	-		
125	1989	22,950		26 Special Tactics Sqdrn	Yes	AFFF	1989	2600 gal	Underwing	Yes	-		
126	1990	22,950		26 Special Tactics Sqdrn	Yes	AFFF	1990	?	Underwing	Yes	-		
133	1993	20,160	3	SNC	Yes	AFFF	1993	1000 gal	Underwing	Yes	-		
173-temp			1	27 SOMXS	No	HX	-	*See 179*	Overhead	Yes	-		
174-temp			1	Force Support Sqdrn Gym	No	HX	-	*See 179*	Overhead	Yes	-		
179 (mech. room)			-	-	-	HX		2x 450 gal	-	-	No		Pump house/mechanical room supporting 173 & 174
194	1969	Unknown	4	SNC	No	HX	2008?		Overhead	Yes	No		
195			2	727 SOAMXS	No	HX	-		Overhead	Yes	No		
196			2	727 SOAMXS	No	HX			Overhead	Yes	No		
197	1990	16,650	2	727 SOAMXS	Yes	AFFF	1990	?	Underwing	Yes	-		
199	1992	34,648	3	SOF CV-22 AMU	Yes	HX	1999	?		Yes	**Yes**	1992-1999	
204	1993	17,295	2	SOF CV-22 AMU	Yes	AFFF	1993	800 gal	Underwing	Yes	-		
208	1995	4,767	5	SOF CV-22 AMU	Yes	HX	Sept. 2013	?		Yes	**Yes**	1995-2013	
4605	2012		1	27 SOAMXS	No	HX	2012		Overhead	Yes	No		
4606	2013		4	27 SOAMXS	No	HX	2013		Overhead	Yes	No		
4607	2013		4	27 SOAMXS	No	HX	2013		Overhead	Yes	No		
4608	2014		1	27 SOAMXS	No	HX	2014		Overhead	Yes	No		
4609	2014		1	27 SOAMXS	No	HX	2014		Overhead	Yes	No		
4610	2014		1	27 SOAMXS	No	HX	2014		Overhead	Yes	No		

AFFF Releases - Cannon AFB - 1994 to 2015

DATE	LOCATION	MEDIA	SUBSTANCE	QUANTITY (gal/lbs)	REPORTED BY	RQ	EIIB?	FOLLOW-UP COMPLETE?	COMMENTS	CAUSE	Clean-Up Info
6/29/1994	Fac 199	Concrete Soil	AFFF	50.0 gal	CEO J. Holland	Yes			Discharged to Storm Sewer outside of "Dock 2" No Record of report to NRC		
14-May-96	199		AFFF	12		None	No				
4-Jun-96	Fac 199		AFFF	200		None	No				
17-Jun-96	Fac 208		AFFF	Unk		None	No				
25-Jun-96	Fac 208		AFFF	3		None	No				
2/7/1997	Hangar 126	Asphalt	AFFF	10 gal.	429 ECS	None	No	Yes	Memo to CEV	Accidental charging of the fire suppression system. Deliberate release of AFFF mixture to clear system.	
4/7/1997	199	Soil/Water	AFFF	75 Gals (est)	CEF via CE SCS	No	No	YES	Released AFFF mixture was washed into the floordrain/OWS/Sanitary Sewer and the charged lines were drained into the Sanitary Sewer.	Manual alarm shorted when sprayed with water. Facility occupants were washing walls with a hose. Alarm activated AFFF system when it was shorted.	
18-Jun-97	133	Concrete	AFFF	1.5 gal	CEF	No	No	Yes		CEF Ops Test of Fire Vehicle (P-19) Malfunction resulted	
3/3/1998	Hangar 208	Concrete/ Wastewater	AFFF	< 5 gal	CEF	No	No	Yes	AFFF contained inside Bldg Discharged to San. Sewer	False Fire Sys Activation	
6/25/1998	Hangar 208	Concrete/ WWTP	AFFF	Possibly 1000 gals of concentrate	CEOL1	NO	??	No	Two releases. Leak from storage tank in AM: System leak in PM BOD5 on 6/26 = 49 mg/L	Leak from flange on end of 1200 gal tank May have been leaking 48 hours or more. Conc AFFF discharged to WWTP. In PM a valve gasket blew and released more concentrate? Discharged to san sewer and ramp.	
7/30/1998	Fac 208	San. Sewer	AFFF	20 Gal	CES	NO	No	Yes	Discharged during bladder replacement on AFFF tank	Acc. Release	

AFFF Releases - Cannon AFB - 1994 to 2015

DATE	LOCATION	MEDIA	SUBSTANCE	QUANTITY (gal/lbs)	REPORTED BY	RQ	EIIB?	FOLLOW-UP COMPLETE?	COMMENTS	CAUSE	Clean-Up Info
12/4/1998	208	Concrete/ WWTP	AFFF		CEO	No	NO	YES	Accidental Release in mech room	Operator Error	
24-Dec-99	Hangar 109	Asphalt	AFFF	500 gal.	CEF	No	No	No	WWTP notifed after foam had reached there. QTY est requested from CEOL1	Office fire activated AFFF system.	
28-Nov-00	Hangar 126	Concrete	AFFF	30 Gals		No	No		Discharge was from one underwing nozzle in center of hangar bay.	Fire alarm activation caused partial discharge of AFFF system.	
7-Dec-00	Hangar 133	Concrete, soil, and Storm Drain	AFFF & water	unknown several hundred gallons, mostly water	CEOL	No	No		Contents of fire suppression system (including some AFFF residual) was flushed onto hangar floor and onto the	Uncontrolled release from scheduled rinsing of fire system.	
14-Dec-00	Hangar 197	Concrete & Storm Drain	AFFF & Water	unknown	CEO/ Sgt Hewitt	No	No	Yes	CE Plumbers were in the process of testing/draining the system lines when a valve under pressure (175 lbs est.) broke the side out of a steel valve.	Ruptured fire suppression valve.	
18 Jul 2001	Hangar 133	soil and WWTP	AFFF	200 gals	CEF	Yes	No		J Rebman reported this to EPA (and NMED) because more than a "trace amount" reached the N. Playa (waters of the US). CEF used booms to keep out of storm sewer. There was as discharge to the WWTP via floor drains.	Discharged following power outage/surge.	Foam that did not o down the floor drain was washed to the infield soil.
5/2/2002	Hangar 204	Concrete	AFFF	UNK	CEOL/T. Thompson	No	No	Yes	Release occurred at approx 0400. CEOL estimated that 700 gals of AFFF discharged from 800 gal capacity tank.	Bldg heater came on, millers/birds/nests in heater caught fire, flame caused fire system to activate.	AFFF evaporated on concrete ramp.
9/7/2002	Hgr 125	Concrete	AFFF & Water	3300 (Water) 110 gal AFFF)	CEF	No	No	Yes	It appears that the drain valves did not activate to close the drains.	A "-60" (Power Gen) was started while in/near the hangar. This caused the fire system to activate.	AFFF went down sanitary drain and/or evaporated on the ramp.

AFFF Releases - Cannon AFB - 1994 to 2015

DATE	LOCATION	MEDIA	SUBSTANCE	QUANTITY (gal/lbs)	REPORTED BY	RQ	EIIB?	FOLLOW-UP COMPLETE?	COMMENTS	CAUSE	Clean-Up Info
2/4/2003	Hangar 199	Concrete/Soil	AFFF/Water	3 Gallons (AFFF)	CEOL/Richter	None	No		Question: Why was system only 10% charged/	Fire Alarm Pull box accidentally activated	Water with AFFF discharged to ramp and some to Storm drain via Mech room.
8 Apr 05 (approx 0345)	Hangar 197	Concrete + Drain	Possible AFFF	Unk	CEF	N/A	No		Partial discharge of fire system into hangar bay from two wing level nozzles. Plumbers responded. Told CEF that "some" went into drain. WWTP and CEVC not notified by plumbers.	Unknown	None Required. No foam observed in WWTP wet well or N Playa Lake. CES Plumbers drained lines and reset system.
9/26/2006	H119	Asphalt, Dirt drainage ditch, S Playa Lake	AFFF	60 gals (est)	CEF	None	No	Not Reportable as SW NPDES does not prohibit foam discharge to this surface water.	AFFF entered storm drains and the South Playa Lake. Not reportable because no RQ exceeded. There is no RQ for AFFF/glycol ethers. Bill Ricter estimated (after viewing the tank site glass) that approx 60 gals of concentrate was released from the 500 gal tank.	Cause of fire system activation undetermined. Could be a corroded valve. CES Plumbers tested the system with water in the morning of the same day.	AFFF was discharged via the concrete storm pipe into a soil ditch and a small amount of water in the South Playa Lake.
8/3/2009	Hgr 109	Steel Tank	AFFF	300 gals	USACE/ K Wylie	no	no		Contractor doing work on Fire Supression System discovered that bladder inside tank was leaking. Six drums of AFFF was removed from the tank. No release to environment.		Contractor will dispose? Disposal
9/13/2012	Hgr 119	Asphalt & Concrete	AFFF	Unknown (a lot)	CEF	No	No	Yes	Accidental release inside Bay One. Some foam did enter storm drain that leads to S Playa Lake. Most allowed to evaporate on concrete/asphalt surfaces. Cannon "911" agencies responded.	Unknown. Being investigated by SOCES/CEO	AFFF foam allowed to evaporate.
7/22/2013	Hgr 119	Concrete	AFFF	Unk	CEF/Scheib	No	No	Yes	CEIE was notified by Fire Dept. H119 has floor trenches sealed e.g. no path to WWTP.	Unk	N/A

AFFF Releases - Cannon AFB - 1994 to 2015

DATE	LOCATION	MEDIA	SUBSTANCE	QUANTITY (gal/lbs)	REPORTED BY	RQ	EIIB?	FOLLOW-UP COMPLETE?	COMMENTS	CAUSE	Clean-Up Info
9-Dec-13	Hgr 195	Concrete	AFFF	Unk	CEF	N/A	No	Yes	No discharge to WWTP of waters	System activated while Bldg heaters being repaired	Foam allowed to evap

Exhibit 3

Message (Digitally Signed)

From: SEGURA, CHRISTOPHER G GS-14 USAF AFCEC/CZO [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=E6C1464D70C64C4DB3FD0BDAB577F91C-SEGURA.CHRI]
Sent: 8/14/2018 10:19:21 PM
To: McQuillan, Dennis, NMENV [dennis.mcquillan@state.nm.us]; Hunter, Michelle, NMENV [Michelle.Hunter@state.nm.us]
CC: RENAGHAN, BRIAN J GS-13 USAF AFMC AFCEC/CZRX [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=1dfd006e2c3b4f9bbbfa4adc96aad20c-RENAGHAN.BR]; KOTTKAMP, SHEEN T GS-12 USAF AFCEC AFCEC/CZOW [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=74036fffe855487898f90e950e41dcb0-KOTTKAMP.SH]; Kieling, John, NMENV [john.kieling@state.nm.us]
Subject: PFCs_Cannon AFB_1203 Discharge Notification
Attachments: smime.p7s

In follow up to the initial oral notification of release made today to Ms. Hunter (via voicemail) a written notification is being provided pursuant to the release reporting requirements specified in NMAC 20.6.2.1203(A). The referenced NMAC reporting requirements are fundamentally equivalent to the "Twenty-Four Hour and Subsequent Reporting" requirements in Part 1.5.10.c of the Cannon AFB RCRA Permit.

(a) **Person In Charge:**
Sheen T. Kottkamp
Kirtland ISS, AFCEC/CZO
2050 Wyoming Boulevard Southeast
Kirtland Air Force Base, New Mexico 87117-5270
Office 505-846-7674
Mobile 806-463-0811
sheen.kottkamp.1@us.af.mil

Facility owner:
Stewart A. Hammons, Colonel, USAF
27 Special Operations Wing, Commander
100 Air Commando Way
Cannon Air Force Base, 88103
Office 575-784-2727

(b) Location of Discharge: Release/detection of Aqueous Film Forming Foam (AFFF) at Cannon AFB containing perflourinated compounds PFOS and PFOA impacting groundwater within the southeast area of the installation.

(c) Date/Time Release: The release of AFFF is historic in nature. Exact date and time of release is unknown. Duration of discharge is also unknown at this time.

(d) Source and Cause of Discharge: Historic fire fighter training activities are the probable source of the release.

(e) Description of Discharge: AFFF containing perflourinated compounds PFOS and PFOA impacting groundwater.

(f) Estimated Volume: Volume of AFFF released is unknown.

(g) Actions Taken to Mitigate Potential Damage: Identification and sampling of off-site down gradient wells as part of an ongoing Site Investigation.

Planned actions: The Air Force has conducted a Site Investigation of potentially PFOS/PFOA impacted areas including soil and groundwater sample acquisition. Groundwater monitoring wells located in the southeast area of the installation down-gradient of former fire training areas had detections above the preliminary health advisory of 70ppt. The draft final groundwater report will be available and analytics provided upon Air Force receipt of the referenced report. An expanded Site Investigation will be conducted to determine any potential impact to off-site domestic/livestock wells down-gradient from the installation boundary.

V/R

From: McQuillan, Dennis, NMENV <dennis.mcquillan@state.nm.us>
Sent: Monday, August 13, 2018 3:07 PM
To: CLARK, SCOTT C GS-13 USAF AFCEC/CZO <scott.clark@us.af.mil>; RENAGHAN, BRIAN J GS-13 USAF AFMC AFCEC/CZRX <brian.renaghan@us.af.mil>
Cc: SEGURA, CHRISTOPHER G GS-14 USAF AFCEC/CZO <christopher.segura.2@us.af.mil>; KOTTKAMP, SHEEN T GS-12 USAF AFCEC AFCEC/CZOW <sheen.kottkamp.1@us.af.mil>; Hunter, Michelle, NMENV <Michelle.Hunter@state.nm.us>
Subject: [Non-DoD Source] perfluorinated compound detections at Cannon Air Force Base

Scott and Brian,

Without having seen the laboratory report for these detections (specific wells, compounds and concentrations) NMED believes that the Air Force needs to provide a formal notice of discharge to NMED pursuant to N.M. Water Quality Control Commission (WQCC) regulation 20.6.2.1203.A.1 NMAC (copy attached). Please be aware that this notification regulation does not reference, and is not limited to, specific chemical parameters that are included in the WQCC groundwater or toxic pollutant standards. The detection of contaminants in groundwater is a notifiable discharge even if the specific date, sources and volumes of the discharge are not yet known.

As such, please provide myself and Ground Water Quality Bureau Chief Michelle Hunter with a copy of the laboratory package for the perfluorinated compound detections at Cannon Air Force Base within 24 hours of this email.

Thanks,

20.6.2.1203 NOTIFICATION OF DISCHARGE-REMOVAL:

A. With respect to any discharge from any facility of oil or other water contaminant, in such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life, or property, or unreasonably interfere with the public welfare or the use of property, the following notifications and corrective actions are required:

(1) As soon as possible after learning of such a discharge, but in no event more than twenty-four (24) hours thereafter, any person in charge of the facility shall orally notify the chief of the ground water quality bureau of the department, or his counterpart in any constituent agency delegated responsibility for enforcement of these rules as to any facility subject to such delegation. To the best of that person's knowledge, the following items of information shall be provided:

(a) the name, address, and telephone number of the person or persons in charge of the facility, as well as of the owner and/or operator of the facility;

(b) the name and address of the facility;

(c) the date, time, location, and duration of the discharge;

(d) the source and cause of discharge;

(e) a description of the discharge, including its chemical composition;

(f) the estimated volume of the discharge; and

(g) any actions taken to mitigate immediate damage from the discharge.

(2) When in doubt as to which agency to notify, the person in charge of the facility shall notify the chief of the ground water quality bureau of the department. If that department does not have authority pursuant to commission delegation, the department shall notify the appropriate constituent agency.

Dennis McQuillan
Chief Scientist
New Mexico Environment Department
1190 St. Francis Dr.
PO Box 5469
Santa Fe, NM 87502
505-827-2140 desk
505-660-1592 cell
dennis.mcquillan@state.nm.us

Exhibit 4

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS MISSION SUPPORT GROUP (AFSOC)
CANNON AIR FORCE BASE NEW MEXICO

August 30, 2024

Colonel Stuart E. Churchill, USAF
Commander
27th Special Operations Mission Support Group
110 Alison Ave Suite 1098
Cannon AFB NM 88103-5167

Mr. Robert Murphy
Ground Water Bureau
New Mexico Environment Department
1190 St Francis Drive
Santa Fe NM 87502-5469

Mr. Gabriel Acevedo
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg. I
Santa Fe NM 87505-6313

Dear Mr. Murphy and Mr. Acevedo

On 24 August 2024, Mr. Murphy was initially provided verbal notification of a constituent release on Cannon Air Force Base (AFB). This letter provides current information and actions being taken to address the release of PFAS-containing liquid within the Active Fire Training Area and Adjacent Ponding Area to both the Ground Water Bureau and Hazardous Waste Bureau.

a) The owner of the facility is Colonel Robert L. Johnston, Commander, 27th Special Operations Wing, located at 511 N Chindit Blvd, Cannon AFB, NM 88103-5469; phone number 575-784-2727.

b) The address for Cannon AFB is 100 Air Commando Way, Cannon AFB, NM 88103.

c) Between on or about 9 July 2024 and on or about 15 July 2024, Cannon AFB personnel deposited approximately 7,300 gallons of fire department rinsate with traces of aqueous film forming foam (AFFF) into the lined retention pond within the Active Fire Training Area and Adjacent Ponding Area. The retention pond liner was most recently inspected by a third-party contractor and found compliant on 4 March 2024. Upon notification of the improper deposit of rinsate, Cannon AFB personnel pumped all of the remaining liquid from the lined retention pond on 14 August 2024, and placed it in 330-gallon totes. A total of approximately 3,600 gallons were recovered. These quantities do not accurately account for any constituents captured in possible rainwater accumulation or liquid evaporation. Once containerized, the liquid was placed in secure storage pending further analysis. On 23 August 2024, a third-party contractor inspected the retention pond and reported that the liner had been compromised in several areas, including approximately 13 tears in the material. At this time, it is unclear if the pond liner was compromised during the 14 August 2024 extraction effort.

d) The estimated volume of liquid release through the liner is still being determined. From the approximate time that the rinsate was deposited to 14 August 2024, the liquid was exposed to significant

and sustained sunlight, and sporadic rainfall. The 3,600 gallons of extracted and re-containerized liquid is currently undergoing further testing.

e) All liquid has been extracted from the retention pond. Further, the retention pond liner has been temporarily patched and covered with a water-resistant tarp to prevent further rainfall from reaching the impacted soil. Further use of the impacted area has been suspended indefinitely, and the area has been cordoned off with fencing and locked and secured with barriers to block the roadway to limit access. An administrative investigation has been initiated to determine the root cause of the improper disposal and should be completed by 20 September 2024. Samples of the extracted liquid and sediment are containerized and are set to undergo further testing and characterization. The Air Force will sample and fully characterize the area to inform any necessary corrective measures.

The DAF remains committed to transparency and coordinating with NMED as we move forward.

If you have any questions, please contact Ms. Sara Newton, Water Quality Program Manager, at sara.newton@us.af.mil.

Sincerely

CHURCHILL.STUART.EDWARD.1125888433

Digitally signed by CHURCHILL.STUART.EDWARD.1125888433
Date: 2024.08.30 09:57:45 -06'00'

STUART E. CHURCHILL, Colonel, USAF
Commander, 27 SOMSG

Exhibit 5

IN RE: Aqueous Film-Forming Foams (AFFF)
Products Liability Litigation

This State Government Plaintiff Fact Sheet is to be completed by State Government Plaintiff(s) or United States Territory Government Plaintiff(s) (the "State Government Plaintiff(s)") in any action transferred to or originally filed in this multi-district litigation that is brought by State Government Plaintiff(s) as trustee for natural resources of the State, in their *parens patriae* capacity on behalf of residents of the State, and/or any other similar capacity related to State sovereign or quasi-State sovereign interests. For the purposes of this State Government Plaintiff Fact Sheet, "you" or "your" refers to the named State Government Plaintiff(s) in each action only and is circumscribed by relevant law governing the scope of and limitations on each particular State Government Plaintiff's control over non-plaintiff state agencies.[1] The scope of the questions herein and responses thereto will be limited to information and/or documents within the possession, custody, or control of those Plaintiffs. In completing this State Government Plaintiff Fact Sheet, you are under oath, subject to the penalties of perjury, and must provide information that is true and correct to the best of your knowledge. If you cannot recall all the details requested, please provide as much information as you can. If a response will require in part or in full an expert opinion(s), please so indicate, but such an indication shall not be a basis for failure to respond with information and facts in the possession of the State Government Plaintiff at this time. Materials prepared by your attorneys for use in the litigation (Attorney Work Product) are not required to be produced, nor are documents subject to any other applicable privileges or protections, including but not limited to the deliberative process privilege, required to be produced. You must complete the State Government Plaintiff Fact Sheet in accordance with the requirements and guidelines set forth in Case Management Order No. 5 and subject to the processes and procedures set forth in CMO No. 5, except that State Government Plaintiffs shall have 112 days from Court approval of this Fact Sheet to submit responses. To the extent that any response requires additional space, please insert additional space or information or attach a continuation sheet referencing the question at issue. While the State Government Plaintiffs' prefiling and subsequent investigative efforts have been substantial, Plaintiffs have not fully completed, among other things, their: (i) investigation of all of the facts relating to the respective litigation(s); (ii) discovery; or (iii) preparation for trial. The State Government Plaintiff(s)' Responses are based upon facts and information known by the respective State Government Plaintiff at the time of responding to this State Government Plaintiff Fact Sheet and upon the current status of the proceedings. State Government Plaintiff(s) reserve the right to supplement, modify, or amend these responses in accordance with the applicable Rules of Civil Procedure. **ALL ASPECTS OF THIS STATE GOVERNMENT PLAINTIFF FACT SHEET ARE DESIGNATED AS CONFIDENTIAL AND COVERED BY THE PROTECTIVE ORDER.**

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[1] For the avoidance of doubt, the definition of "you" or "your" excludes state executive agencies that are not named plaintiffs in the respective State Government litigation and over whom the named Plaintiff does not have the requisite control for purposes of discovery. Defendants reserve the right to seek additional information concerning any claims of lack of requisite control, and Defendants do not waive any rights to seek discovery from any such other state executive agencies.

I. CASE INFORMATION

1. **Caption:** State of New Mexico, et al. v. United States, et al.

2. **Docket No.:** 2:20-cv-02115-RMG

II. PLAINTIFF INFORMATION

3. **Plaintiff's Name:** State of New Mexico; James Kenney, in his official capacity as Cabinet Secretary of the New Mexico Environment Department; and Maggie Hart Stebbins, in her official capacity as Natural Resources Trustee for the State of New Mexico.

4. **Plaintiff's Address:**

New Mexico Attorney General's Office
408 Galisteo Street
Villagra Building
Santa Fe, New Mexico 87501

New Mexico Environment Department
1190 St. Francis Drive
Suite N4050
Harold L. Runnels Building
Sante Fe, New Mexico 87505

New Mexico Office of Natural Resources Trustee
121 Tijeras Avenue, NE
Suite 1000 (mail)
Suite 2000 (physical location)
Albuquerque, New Mexico 87102

5. **Name of individual signing this Plaintiff Fact Sheet (or portion of this Plaintiff Fact Sheet) and his/her relationship to Plaintiff:**

Maggie Hart Stebbins, Natural Resources Trustee for the State of New Mexico; and

Frederic L. Shean, Jr., Division Director, Resource Protection Division, New Mexico Department of Environment.

III. ALLEGED CONTAMINATION

6. **Do you claim that the State's natural resources were or are injured or endangered as a result of contamination with per- or polyfluoroalkyl substances ("PFAS," an umbrella term that includes, among other substances, perfluorooctane sulfonate (PFOS) and/or perfluorooctanoic acid (PFOA)), related to the storage, use, and/or disposal of aqueous film forming foam ("AFFF")? ☒ Yes ☐ No**

For each site where you have identified such injury, describe the general nature of the alleged harm or endangerment, or provide documents sufficient to indicate the general nature of the alleged harm or endangerment as to each site or location.

As a result of Defendants' past and present handling, storage, treatment, transportation, and/or disposal of PFAS-containing AFFF, the State's natural resources have been damaged and/or endangered at and/or near the following sites: Cannon Air Force Base, Holloman Air Force Base, Kirtland Air Force Base, White Sands Missile Range (a U.S. Army facility), and Fort Wingate (same). Through exposure to PFAS (including but not limited to PFOA and PFOS), soil, sediment, surface waters, groundwater, plants, and wildlife have been contaminated at these sites. In addition to natural resource injuries inherent in such contamination, the contamination of these sites also threatens and/or injures plants, wildlife, and people that may be exposed to abiotic media (*e.g.*, surface water, soil, sediment, or groundwater) and biotic media, through dietary consumption at or around the sites. It also reduces natural resource services, including both ecological services and human use and non-use services. The State's efforts to assess and investigate the natural resource injuries at these sites are ongoing.

Additionally, conditions at Cannon and Holloman Air Force Bases caused by Defendants' past and present handling, storage, treatment, transportation, and/or disposal of PFAS-containing AFFF present an imminent and substantial endangerment to health and/or the environment via continued migration of PFAS contamination in groundwater and/or drinking water, as well as recreational waters and those supporting wildlife, at and around Cannon and Holloman Air Force Bases.

7. **Do you claim that PFAS poses a risk to human health?** ☒ **Yes** ☐ **No**

If yes, describe all such claimed risks or provide documents related thereto.

PFAS, including PFOS and PFOA, are toxic, meaning that they pose significant threats to public health and the environment.[1] Exposure to PFOS and PFOA presents health risks even when PFOS and PFOA are ingested at seemingly low levels.[2]

PFOS and PFOA exposure is associated with increased risk of a variety of illnesses including testicular cancer, kidney cancer, thyroid disorders, high cholesterol, ulcerative colitis, liver cell death, decreased immune system response to vaccines, and adverse effects on reproductive health.[3] The chemicals are particularly dangerous for pregnant woman and young children, and are

[1] U.S. EPA, *Technical Fact Sheet—Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA)* (Nov. 2017), at 2, *available at* https://www.epa.gov/sites/default/files/2016-05/documents/pfoa_health_advisory_final_508.pdf (hereinafter *EPA DWA Fact Sheet*); *see also PFAS National Primary Drinking Water Regulation* (April 26, 2024), 89 Fed. Reg. 32532 (hereinafter *PFAS MCL*).

[2] *See* EPA, Drinking Water Advisory for Perflurooctanoic Acid (PFOA) (May 2016), *available at* https://www.epa.gov/sites/production/files/2016-05/documents/pfoa_health_advisory_final_508.pdf (hereinafter *EPA Drinking Water Advisory for PFOA*); EPA, Drinking Water Advisory for Perflurooctane Sulfonate (PFOS) (May 2016), https://www.epa.gov/sites/production/files/2016-05/documents/pfos_health_advisory_final_508.pdf (hereinafter *EPA Drinking Water Advisory for PFOS*).

[3] *EPA DWA Fact Sheet*, at 3; *EPA Drinking Water Advisory for PFOA*, at 39-42; *PFAS MCL* at 32536-37; 39-42; National Academies of Sciences, Engineering, and Medicine, *Guidance on PFAS Exposure, Testing, and Clinical*

associated with pregnancy-induced hypertension and low birth weight.[4]

Toxicology studies show that PFOS and PFOA are readily absorbed after oral exposure and are relatively stable once ingested so that they accumulate over time in individual organs, primarily the blood serum, kidney, and liver.[5] Studies further found that individuals with occupational exposure to PFOA run higher risks of bladder and kidney cancer.[6] In studies involving laboratory animals, PFOA and PFOS exposure increased the risk of tumors, changed hormone levels, and affected the function of the liver, thyroid, pancreas, and the immune system.[7]

The adverse effects associated with both PFOS and PFOA are additive when both chemicals are present, meaning that their individual adverse effects are cumulative.[8] However, injuries are not sudden and can arise months or years after exposure to PFOS and/or PFOA. PFAS chemicals are often found together in the environment, and some PFAS chemicals degrade into other PFAS chemicals.[9]

While more studies have been conducted and, thus, more is known regarding PFOS and PFOA, all PFAS have generally similar chemical characteristics to PFOS and PFOA. Information on the health effects of PFAS continues to evolve as ongoing studies continue.

8. At this time, are you claiming damages on behalf of a specific drinking water provider(s) within the State? ❑Yes ▣ No

If "yes," identify each drinking water provider on behalf of which you are claiming damages.

9. Are you otherwise claiming damages as a result of an alleged injury to the drinking water within the State? ▣Yes ❑ No

If "yes," identify each drinking water source(s) (e.g., by geographic area, GIS coordinates, water system, wellhead and well depth, or other identifying information as available and if known) with respect to which you are claiming damages.

Defendants' past and present handling, storage, treatment, transportation, and/or disposal of PFAS-containing AFFF have damaged groundwater sources in the State which, in addition to being natural resources of the State, are also drinking water sources: the Ogallala Aquifer; the Rio Grande aquifer; the San Andres-Glorieta aquifer; groundwater in the Tularosa Basin; groundwater in the

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Follow-Up. The National Academies Press (2022), at 62-63, *available at* https://doi.org/10.17226/26156.

[4] *Id.*

[5] *EPA Fact Sheet*, at 3; *PFAS MCL* at 32536.

[6] *EPA Drinking Water Advisory for PFOA*, at 39-42.

[7] *See EPA Drinking Water Advisory for PFOA*, at 35-39, 44-45; *EPA Drinking Water Advisory for PFOS*, at 36-37, 42.

[8] *See* U.S. Dep't of Health and Human Services and Centers for Disease Control and Prevention, *Fourth National Report on Human Exposure to Environmental Chemicals*, Updated Tables (March 2018), *available at* https://www.cdc.gov/exposurereport/pdf/FourthReport_UpdatedTables_Volume1_Mar2018.pdf.

[9] EPA, Long-chain Perfluorinated Chemicals (PFCs) Action Plan (Dec. 30, 2009), https://www.epa.gov/sites/production/files/2016-01/documents/pfcs_action_plan1230_09.pdf.

Jornada del Muerto Basin; and groundwater in the Middle Rio Grande Basin.

10. If you answered "Yes" to Question #8 and/or Question #9, please identify all geographic regions or communities served by the water provider(s) or water source(s) identified.

Bernalillo, Sandoval, McKinley, Curry, Roosevelt, Otero, Lincoln, Sierra, Socorro, & Dona Ana Counties, New Mexico.

11. State the location(s) with respect to which you assert a claim in these MDL proceedings relating to PFAS contamination. For each such site, provide documents related to the source of PFAS contamination at that site, if known.

The State asserts claims related to PFAS contamination at and around the following sites:

a) Cannon Air Force Base (Clovis, New Mexico)

b) Holloman Air Force Base (Alamogordo, New Mexico)

c) Kirtland Air Force Base (Albuquerque, New Mexico)

d) White Sands Missile Range (spanning Dona Ana, Socorro, Lincoln, Otero, and Sierra Counties)

e) Fort Wingate (Gallup, New Mexico)

Concurrently with the submission of this Fact Sheet, the State is providing documents related to the source of PFAS contamination at each of these sites.

12. For each site identified in the response to the prior question, provide the test results and test data for all tests that you have conducted or of which you are aware for the presence of PFAS contamination in water, soil, air, wildlife, and/or other natural resources.

Concurrently with the submission of this Fact Sheet, the State is providing documents containing test results/data for the presence of PFAS contamination at each site.

13. Do you claim that any military base(s) or site(s) operated now or in the past by any agency or department of the U.S. government are a potential source of alleged AFFF-related PFAS contamination? ☒Yes ☐ No

If yes, please identify the site(s):

The State asserts claims related to PFAS contamination at and around the following sites:

a) Cannon Air Force Base (Clovis, New Mexico)

b) Holloman Air Force Base (Alamogordo, New Mexico)

c) Kirtland Air Force Base (Albuquerque, New Mexico)

d) White Sands Missile Range (spanning Dona Ana, Socorro, Lincoln, Otero, and Sierra Counties, New Mexico)

e) Fort Wingate (Gallup, New Mexico)

14. Do you claim that any FAA Part 139 airports are a potential source of alleged AFFF-related PFAS contamination? ❑Yes ▣ No

If yes, please identify the site(s):

15. Do you have any documents or other information (other than what has been produced by Defendants in this litigation) identifying the specific products that you claim to have caused the alleged AFFF-related PFAS contamination and/or indicating how those products reached the site/location of the alleged contamination (*i.e.* photos of product labels at the site, invoices, shipping labels, identity of witnesses, etc.)? ❑Yes ▣ No

If yes, do you have any documents or other information identifying the specific location where these products were allegedly used? ❑Yes ❑ No ▣ N/A

<u>If yes to either/both of the above questions, attach to this form or provide copies of those documents, referencing this question.</u>

16. Have you ever issued or directed, caused, or requested others to issue warnings or advisories (including drinking water, hunting, or fish advisories) regarding the presence of PFAS in the State? ▣Yes ❑ No

If yes, identify or provide documents reflecting the intended recipients of the warning or advisory, the manner in which it was sent out, the approximate date of the warning or notification, and the contents of the warning or notification:

On October 19, 2018, the New Mexico Department of Health issued a warning to the public regarding detections of PFAS in groundwater near Cannon Air Force Base.[10]

On October 16, 2018, the New Mexico Department of Environment and New Mexico Department of Agriculture issued a news release regarding detections of PFAS in groundwater near Cannon Air Force Base, which recommended that residents within four miles of the base use bottled water and encouraged residents to contact the New Mexico Department of Health regarding consultation and further testing.[11]

On May 9, 2019, the New Mexico Department of Health issued a warning to the public regarding high levels of PFAS contamination detected at Lake Holloman.[12]

On February 10, 2022, the New Mexico Department of Health issued a report in *New Mexico Epidemiology*, Volume 2022, Number 1, describing concentrations of PFAS in private wells in southeast New Mexico resulting from the contamination at Cannon Air Force Base.[13]

[10] https://www.nmhealth.org/news/awareness/2018/10/?view=719.
[11] https://www.env.nm.gov/wp-content/uploads/2018/10/PR-CAFB_PFAS-groundwater-contamination_Eng_Span.pdf.
[12] https://www.nmhealth.org/news/information/2019/5/?view=764.
[13] https://www.nmhealth.org/data/view/report/2619/.

17. Have you ever enacted or promulgated any legal or advisory standards, regulations, or guidance for the presence or levels of PFAS compounds in groundwater, surface waters, soil and/or drinking water in the State? ☒Yes ☐ No

If yes, identify or provide documents reflecting all such standards, regulations, or guidance:

In 2018, the New Mexico Water Quality Control Commission added three perfluorinated chemicals—perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorohexane sulfonic acid (PHHxS)—to the list of "toxic pollutants" the State regulates. 20.6.2.7(T)(2)(s) NMAC (listing); *see id.* at 20.6.2.3103 (standard). In February 2019, NMED's Hazardous Waste Bureau, with the Ground Water Quality Bureau, developed the NMED Risk Assessment Guidance for Site Investigation and Remediation, which helps to determine if a site is contaminated to a point that warrants further investigation or action. The associated screening levels and soil screening levels were developed based on the standards found in 20.6.2.3103 NMAC. The Hazardous Waste Bureau uses those screening levels in its administration of the HWA and the Hazardous Waste Management Regulations.

IV. REMEDIATION AND DAMAGES

18. If you answered "yes" to Question 6 (natural resource damages or endangerment), identify the nature of the alleged natural resource damages or endangerment for which you are seeking to recover.

Please see the State's response to Question 6.

19. If you answered "yes" to Questions 8 and/or 9 (drinking water damages), identify the categories of the alleged drinking water damages for which you are seeking to recover.

The categories of drinking water damages for which the State seeks to recover include but are not limited to: groundwater PFAS contamination; natural resource damages; and loss of natural resource services (including ecological and human services).

20. Identify the categories of any other alleged damages, costs, or other relief for which you are seeking to recover.

In addition to natural resource damages, the State seeks:

a) declaratory relief that Defendants' conduct violated the New Mexico Hazardous Waste Act ("NMHWA") and the Resource Conservation and Recovery Act ("RCRA");

b) a permanent injunction directing Defendants to take all steps necessary to achieve permanent and consistent compliance with the NMHWA and RCRA;

c) the payment of costs for the State's oversight and efforts to obtain compliance with the NMHWA and RCRA, and declaratory relief providing a mechanism for the payment of similar future costs;

d) the payment of costs for the State's removal and remedial actions at and around the sites at-issue, and declaratory relief providing a mechanism for the payment of similar future costs;

e) the payment of costs for the State's investigation and assessment of natural resource damages caused by the release of PFAS from the sites at-issue, and declaratory relief providing a mechanism for payment of similar future costs;

f) all available civil penalties;

g) litigation costs and attorneys' fees; and

h) other such relief as may be necessary, just, or appropriate under the circumstances.

21. Are you aware of any steps that have been taken to remediate or mitigate the claimed impact of any AFFF-related PFAS contamination for which you are seeking to recover?
☒Yes ☐ No

If yes, describe or provide documents about completed remediation or mitigation projects, or site-related actions that have been taken as of the date of each respective State's responses, including identifying all actions taken, the date(s) on which such actions were undertaken, and the costs of such actions, if known.

Cannon Air Force Base:

The U.S. Air Force has provided alternative drinking water to some residents living at or near Cannon Air Force Base, beginning in 2018. Documents relating to this action are being provided concurrently with the submission of this Fact Sheet. New Mexico is not aware of the cost.

The U.S. Air Force installed point-of-use water treatment systems for some residents living near Cannon Air Force Base in or around 2020. According to the Air Force Civil Engineer Center ("AFCEC"), the cost was $843,515 as of May 2024.

The U.S. Air Force has recently (2024) constructed a facility ("Pilot Study") designed to pump and treat the contaminated groundwater at Cannon for PFAS.[14] According to the AFCEC, the cost was $23,576,561 as of May 2024. Documents relating to the facility are being provided concurrently with the submission of this Fact Sheet.

The New Mexico Environment Department assisted and funded a Depopulation and Removal Plan related to the contamination of a herd of dairy cattle at Highland Dairy, which neighbors Cannon Air Force Base. The cost was $850,000. Documents relating to this action are being produced concurrently with the submission of this Fact Sheet.

Finally, the U.S. Air Force and the State of New Mexico have conducted investigations to determine the nature and extent of PFAS contamination at Cannon Air Force Base. Such investigations do not

[14] *See* https://www.cannon.af.mil/Portals/85/14May2024%20CAFB%20PFAS%20Public%20Update.pdf. The State is not aware whether or not the facility is currently in operation.

constitute "action . . . to remediate or mitigate" PFAS contamination, but are "site-related actions" that may form the basis for and/or inform potential future actions to remediate or mitigate the contamination at those sites. Thus, they are described below.

- A Preliminary Assessment in 2015; according to the AFCEC, the cost was $38,754
- A Site Inspection in 2016-2018; according to the AFCEC, the cost was $2,024,231
- A "follow-on" Site Inspection in 2018-2019; according to the AFCEC, the cost was $505,000
- A Treatability Study in 2021-2022
- An Aquifer Test in 2021-2022
- An investigation to characterize PFAS in groundwater on and in the vicinity of Cannon Air Force Base (contracted to Daniel B. Stephens & Associates, Inc. by the New Mexico Environment Department's Hazardous Waste Bureau); the cost was $438,780.99

Reports of these investigations are being provided concurrently with the submission of this Fact Sheet. New Mexico is also aware that the U.S. Air Force initiated a Remedial Investigation at Cannon Air Force Base in August 2020, and that it is scheduled for completion in August 2026. According to the AFCEC, the cost of the Remedial Investigation was $10,684,793, as of May 2024.

Holloman Air Force Base:

New Mexico is not aware of any steps taken to remediate or mitigate the PFAS contamination present at Holloman Air Force Base. However, the U.S. Air Force and the State of New Mexico have conducted investigations to determine the nature and extent of PFAS contamination at the site. Such investigations do not constitute "action . . . to remediate or mitigate" PFAS contamination, but are "site-related actions" that may form the basis for and/or inform potential future actions to remediate or mitigate the contamination at those sites. Thus, they are described below.

- A Preliminary Assessment in 2015
- A Site Inspection in 2017-2018
- A technical review on the hydrogeologic and surface hydrology setting around Holloman Air Force Base for the potential impact of PFOA, PFOS, and PFBS at off-installation drinking water wells, performed by the AFCEC in 2021
- An investigation to characterize PFAS in groundwater on and in the vicinity of Cannon Air Force Base (contracted to Daniel B. Stephens & Associates, Inc. by the New Mexico Environment Department's Hazardous Waste Bureau); the cost was $514,198.49
- A study of PFAS contamination in wildlife at or near Lake Holloman, performed by the University of New Mexico in 2021-2023

Reports of these investigations are being provided concurrently with the submission of this Fact Sheet. New Mexico is not aware of the specific costs for the U.S. Air Force's investigations, but is aware that the United States claims to have spent or obligated $3,898,000 to investigate and perform removal actions in response to PFAS at the site through fiscal year 2023. New Mexico is also aware

that the U.S. Department of Defense has claimed to have initiated a Remedial Investigation at the site, with an estimated completion date of 2027.[15]

Kirtland Air Force Base:

New Mexico is not aware of any steps taken to remediate or mitigate the PFAS contamination present at Kirtland Air Force Base. However, the U.S. Air Force has conducted investigations to determine the nature and extent of PFAS contamination at the site. Such investigations do not constitute "action . . . to remediate or mitigate" PFAS contamination, but are "site-related actions" that may form the basis for and/or inform potential future actions to remediate or mitigate the contamination at those sites. Thus, they are described below.

- A Preliminary Assessment in 2015;
- A Site Inspection in 2017;
- A technical review on the hydrogeologic and surface hydrology setting around Kirtland Air Force Base for the potential impact of PFOA, PFOS, and PFBS at off-installation drinking water wells, performed by the AFCEC in 2021;
- An additional Site Inspection in 2023-2024.

Reports of these investigations are being provided concurrently with the submission of this Fact Sheet. New Mexico is not aware of the cost. New Mexico is also aware that the U.S. Department of Defense has initiated a Remedial Investigation at the site, with an estimated completion date of 2029.[16]

White Sands Missile Range:

New Mexico is not aware of any steps taken to remediate or mitigate the PFAS contamination present at White Sands Missile Range. However, the U.S. Army has conducted investigations to determine the nature and extent of PFAS contamination at the site. Such investigations do not constitute "action . . . to remediate or mitigate" PFAS contamination, but are "site-related actions" that may form the basis for and/or inform potential future actions to remediate or mitigate the contamination at those sites. Thus, they are described below.

- A Preliminary Assessment in 2018
- A Site Inspection in 2020 and 2022

Reports of these investigations are being provided concurrently with the submission of this Fact Sheet. New Mexico is not aware of the cost. New Mexico is also aware that the U.S. Army has claimed that a Remedial Investigation is underway at the site, but is not aware of any estimated completion date.[17]

Fort Wingate:

New Mexico is not aware of any steps taken to remediate or mitigate the PFAS contamination present at Fort Wingate. However, the U.S. Army has conducted investigations to determine the

[15] https://www.acq.osd.mil/eie/eer/ecc/pfas/docs/data/DoD-PFAS-Progress-as-of-31DEC23.pdf
[16] *Id.*
[17] https://aec.army.mil/PFAS/NM/WSMR.

nature and extent of PFAS contamination at the site. Such investigations do not constitute "action . . . to remediate or mitigate" PFAS contamination, but are "site-related actions" that may form the basis for and/or inform potential future actions to remediate or mitigate the contamination at those sites. Thus, they are described below.

- A Preliminary Assessment in 2022-2023
- A Site Inspection in 2023

Reports of these investigations are being provided concurrently with the submission of this Fact Sheet. New Mexico is not aware of the cost.

22. Are you currently aware of any action that will be taken in the future to remediate or mitigate the claimed impact of any AFFF-related PFAS contamination for which you are seeking to recover? ☒ Yes ☐ No

If yes, describe or provide documents about remediation or mitigation projects, or site-related actions that you know will be taken as of the date of each respective State's responses, including identifying all actions to be taken, the date(s) on which such actions are expected to be undertaken, and the estimated, budgeted, projected, or calculated costs of such actions, if known.

Cannon Air Force Base:

New Mexico is aware that the AFCEC plans to construct a second facility designed to pump and treat the contaminated groundwater for PFAS at Cannon Air Force Base.[18] According to AFCEC, the cost was $30,292,016 as of May 2024. The State is not aware of any expected date of completion or operation.

Holloman Air Force Base:

Other than the Remedial Investigation the U.S. Department of Defense has claimed is ongoing (*see* response to Question 21), New Mexico is not aware of any planned actions to remediate or mitigate PFAS contamination at Holloman Air Force Base.

Kirtland Air Force Base:

Other than the Remedial Investigation the U.S. Department of Defense has claimed is ongoing (*see* response to Question 21), New Mexico is not aware of any planned actions to remediate or mitigate PFAS contamination at Kirtland Air Force Base.

White Sands Missile Range:

Other than the Remedial Investigation the U.S. Department of Defense has claimed is ongoing (*see* response to Question 21), New Mexico is not aware of any planned actions to remediate or mitigate PFAS contamination at White Sands missile Range.

Fort Wingate:

[18] *See* https://www.cannon.af.mil/Portals/85/14May2024%20CAFB%20PFAS%20Public%20Update.pdf. The State is not aware whether or not the facility is currently in operation.

New Mexico is aware that the U.S. Department of Defense has claimed to have a Remedial Investigation planned for Fort Wingate.[19] Such investigations do not constitute "action . . . to remediate or mitigate" PFAS contamination, but are "site-related actions" that may form the basis for and/or inform potential future actions to remediate or mitigate the contamination at those sites. New Mexico is not aware of any estimated start or completion date, or of the estimated cost.

23. **Have you obtained any recovery or reimbursement of funds from any other entities (public or private) for investigation, testing, or remediation in connection with the presence of AFFF-related PFAS contamination for which you are seeking to recover?**
☒Yes ☐ No

If yes, please identify any such recoveries or attach or provide documents sufficient to identify them, and attach or provide any documents reflecting efforts to obtain such recovery or reimbursement.

In May, 2024, the New Mexico Environment Department received a $18,900,000 federal grant from the U.S. Environmental Protection Agency to detect and address "emerging contaminants", including but not limited to PFAS.

[19] https://aec.army.mil/PFAS/NM/wingate.

DOCUMENTS

Provide all documents and records in your possession which you used and/or relied upon to complete this PFS form, including but not limited to those documents specifically requested in the above questions.

VERIFICATION

I am an authorized agent of the Plaintiff identified below, and I hereby certify that the matters stated herein are either based upon personal knowledge of the undersigned, or for matters not based upon personal knowledge of the undersigned, the facts stated herein have been assembled by authorized employees and counsel to such Plaintiff; and that the undersigned is informed that the facts stated therein are true. I further certify in my capacity as an authorized agent of the Plaintiff identified below that the responses herein are true and complete to the best of the Plaintiff's knowledge, based upon a reasonably diligent search and analysis of the information available to the Plaintiff and its counsel, and that the requested documentation has been provided.

Maggie Hart Stebbins
Maggie Hart Stebbins (Aug 8, 2024 10:38 MDT)
Signature

Maggie Hart Stebbins
Natural Resource Trustee
for the State of New Mexico
Print Name and Title

Maggie Hart Stebbins, in her official capacity as Natural Resource Trustee for the State of New Mexico
Plaintiff

08/08/2024
Date

Frederic L. Shean, Jr.
Frederic L. Shean, Jr. (Aug 8, 2024 10:30 MDT)
Signature

Frederic L. Shean, Jr., Division Director, Resource Protection Division
Print Name and Title

James Kenney, in his official capacity as Cabinet Secretary of the New Mexico Environment Department
Plaintiff

08/08/2024
Date

Exhibit 6

Phase 1 PFAS Investigation Report
Cannon Air Force Base and Surrounding Area
Curry County, New Mexico

Prepared for

New Mexico Environment Department
Hazardous Waste Bureau
Santa Fe, New Mexico

Prepared by

DBS&A
Daniel B. Stephens & Associates, Inc.
a Geo-Logic Company

6020 Academy NE, Suite 100
Albuquerque, New Mexico 87109
www.dbstephens.com
DB21.1060

June 30, 2022

1. Introduction

To better understand the scope of potential and existing environmental contamination associated with per- and polyfluoroalkyl substances (collectively referred to as PFAS) around the state, the New Mexico Environment Department (NMED) has worked with state and federal partners to conduct sampling for PFAS in sediment, surface water, and groundwater around the state. The NMED Hazardous Waste Bureau (HWB) contracted with Daniel B. Stephens & Associates, Inc. (DBS&A) to characterize PFAS in groundwater on and in the vicinity of Cannon Air Force Base (AFB) in Curry County (the Cannon site) and Holloman AFB in Otero County (the Holloman site). This report presents the results of the first phase of work conducted in 2021 and 2022 at the Cannon site under this contract.

1.1 Purpose of the Investigation

The purpose of this work is to quantitatively evaluate the contaminant source and potential migration pathways using a systematic approach through environmental sampling and analysis. This approach will assist in further characterizing the PFAS release within the study area by quantifying contaminants of concern (COCs) present in sediment, surface water, and groundwater at and in the vicinity of the release. The results will assist NMED in the selection of a remedy that reduces risks to human health and the environment.

The investigation will identify and sample all participating Cannon AFB monitor wells and private water supply wells that have had PFAS detections or are at potential risk of future PFAS contamination. The hydrogeology of the Cannon site has been characterized, and potential migration (e.g., paleochannels) and exposure pathways will be identified and assessed to the extent practicable.

In addition to collecting sediment and groundwater samples at the site, DBS&A has evaluated the investigation results to assess the risk to human health and the environment, in support of recommendations for remedial action under Sections 20.6.2.4000 through 20.6.2.4115 of the New Mexico Administrative Code (NMAC). The work has been conducted consistent with the National Oil and Hazardous Materials Pollution Contingency Plan (National Contingency Plan or NCP) described in Title 40, Code of Federal Regulations (CFR), Part 300.

1.2 Project Objectives

NMED identified three objectives for the investigation of the Cannon site:

1. Provide better definition of existing PFAS groundwater plume geometry and predictions of future plume migration and surface water contamination, including empirically derived rates of movements of PFAS contaminants in the subsurface.
2. Identify and sample all participating public and private water supply wells that have had PFAS detections or are at potential risk of future PFAS contamination.
3. Establish regular and comprehensive groundwater monitoring program.

Progress was not made on all of the project objectives during Phase 1 due to a reduction in the project budget after the project was awarded, as well as access issues. The total project budget for both the Cannon and Holloman sites was reduced by approximately 20 percent after award. The project scope was reduced accordingly, by holding off on (1) the groundwater and contaminant transport modeling tasks for the Cannon site and (2) establishing a regular groundwater monitoring program.

A sampling and analysis plan (SAP) (DBS&A, 2021 and 2022) was prepared in accordance with the *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4* (U.S. EPA, 2006). The final SAP was provided to NMED on February 1, 2022. The SAP describes procedures to ensure that the project-specific data quality objectives (DQOs) are met and that the quality of data is known and documented. The SAP presents the project description, project organization and responsibilities, and quality assurance (QA) objectives associated with the sampling and analytical services to be provided in support of characterization activities at the Cannon site.

The overall QA objectives are as follows:

- Obtain technically defensible data and information of known quality to support goals set forth for this project
- Document all aspects of the quality program, including performance of the work and any required changes to work at the site
- Attain quality control (QC) requirements for analyses specified in this SAP

PFAS are extremely persistent in environmental media because the highly stable carbon-fluorine structure of PFAS can only be broken down at very high temperature. Larger PFAS compounds may transform in the environment to so-called "terminal" PFAS compounds, which are typically less than or equal to eight carbon-chain molecules such as PFOA and PFOS and are resistant to environmental degradation processes, such as biodegradation, atmospheric photo-oxidation, direct photolysis, and hydrolysis (ITRC, 2021). Dissipation is by advection, dispersion, and sorption to particulate matter. PFOS has low volatility in ionized form, but can adsorb under limited hydrogeochemical conditions to positively charged sediment particles and be deposited on the ground and into surface water bodies. Because of its persistence, it can be transported long distances in air or water (U.S. EPA, 2016a).

2.2 AFFF

Of particular concern at the Cannon site is the use of AFFF to extinguish fires involving highly flammable liquids. AFFF creates a vapor-sealing film on a hydrocarbon fuel surface, cooling the liquid fuel, depriving the fuel of oxygen, and providing protection against re-ignition by preventing evaporation (Leeson et al., 2021). The USAF began purchasing and using AFFF containing PFOS and PFOA for extinguishing petroleum fires and during firefighting training activities in 1970 (AFIMSC, 2017). By mid-2018, the USAF had transitioned to a new AFFF formula, Phos-Check 3 Percent, which is PFOS-free and contains only trace amounts of PFOA (AFCEC, 2018), although it is possible that stockpiles of old AFFF were used after that time. The USAF restricts use of AFFF to emergency responses and treats all releases as hazardous spills. AFFF contained in aircraft hangar fire protection systems was scheduled to be completed by the end of 2018 (AFCEC, 2018).

2.3 Regulatory Framework

In November 2009, EPA issued residential soil screening levels (SSLs) for PFOA of 16,000 micrograms per kilogram (µg/kg) and for PFOS of 6,000 µg/kg that were derived using EPA's regional screening level (RSL) calculator (U.S. EPA, 2009). In May 2016, the EPA issued a lifetime drinking water HA of 0.07 micrograms per liter (µg/L) (70 nanograms per liter [ng/L]) for PFOS and PFOA, both individually and combined (U.S. EPA, 2016a, 2016b, and 2017b). Sampling results are compared to this HA throughout this document.

On June 15, 2022, the EPA issued lifetime drinking water HAs for 4 perfluoroalkyl substances. These include 2 HAs that replace the HAs that EPA issued in 2016, and final HAs for 2 other PFAS: perfluorobutanesulfonic acid (PFBS) and GenX chemicals (U.S. EPA, 2022). The EPA's new

HAs, which identify the concentration of chemicals in drinking water at or below which adverse health effects are not anticipated to occur, are 0.004 ng/L for PFOA, 0.02 ng/L for PFOS, 10 ng/L for GenX chemicals, and 2,000 ng/L for PFBS (FRL 9855-OW). The updated HAs are based on new science that indicates that some negative health effects may occur with concentrations of PFOA or PFOS in water that are near zero (U.S. EPA, 2022). These interim health advisories will remain in place until EPA establishes a National Primary Drinking Water Regulation (U.S. EPA, 2022).

In 2018, the New Mexico Water Quality Control Commission (NMWQCC) added PFOA, PFOS, and PFHxS to the list of toxic pollutants as they relate to groundwater and surface water [20.6.2.3103(A)(2) NMAC and 20.6.2.7(T)(2)(s) NMAC]. In 2019, NMED established preliminary SSLs for PFOA, PFOS, and PFHxS in residential, industrial, and construction worker exposure scenarios at 1.56 milligrams per kilogram (mg/kg), 2.60 mg/kg, and 7.08 mg/kg, respectively. NMED also established a preliminary screening level for these three PFAS compounds in tap water at 0.07 µg/L (NMED, 2019a). These preliminary screening levels applied to each compound individually or in combination (NMED, 2019a).

In June 2022, NMED issued updated preliminary SSLs for PFAS. These include cancer SSLs for perfluorooctanoate and PFOA for residential, industrial/occupational, and construction worker exposure scenarios of 76.1 mg/kg, 498 mg/kg, and 2,690 mg/kg, respectively, as well as a cancer screening level of 11.1 µg/L for tap water (NMED, 2022). Noncancer SSLs were also issued for 12 PFAS compounds, as follows (NMED, 2022):

- Noncancer SSLs of 18.5 mg/kg, 374 mg/kg, and 80.7 mg/kg, respectively, for residential, industrial/occupational, and construction worker exposure scenarios, and a noncancer screening level of 6.02 µg/L for tap water for PFBS and potassium perfluorobutanesulfonate.
- Noncancer SSLs of 1.23 mg/kg, 24.9 mg/kg, and 5.38 mg/kg, respectively, for residential, industrial/occupational, and construction worker exposure scenarios, and a noncancer screening level of 0.401 µg/L for tap water for perfluorohexanesulfonate and PFHxS.
- Noncancer SSLs of 0.185 mg/kg, 3.74 mg/kg, and 0.807 mg/kg, respectively, for residential, industrial/occupational, and construction worker exposure scenarios, and a noncancer screening level of 0.0602 µg/L for tap water, for perfluorononanoate, perfluorononanoic acid (PFNA), perfluorooctanesulfonate, PFOS, perfluorooctanoate, PFOA, and potassium perfluorooctanesulfonate.

EPA issued the final toxicity assessments for PFBS (U.S. EPA, 2021a) and GenX chemicals in 2021 (U.S. EPA, 2021d) and planned to issue drinking water HAs for these constituents in spring 2022 (U.S. EPA, 2021c). EPA is currently developing toxicity assessments for 5 other PFAS—perfluorobutanoic acid (PFBA), perfluorohexanoic acid (PFHxA), PFHxS, PFNA, and perfluorodecanoic acid (PFDA) (U.S. EPA, 2021c).

In October 2021, EPA issued its PFAS Strategic Roadmap, which establishes timelines for specific actions to protect human health and the environment from PFAS contamination. This effort will include establishing enforceable maximum contaminant levels (MCLs) for PFOA and PFOS, while evaluating additional PFAS and groups of PFAS (U.S. EPA, 2021c). EPA anticipated issuing proposed rules in fall 2022, with final rules in fall 2023 (U.S. EPA, 2021c). At least 28 states have established advisory or regulatory limits or screening levels for two or more PFAS (ITRC, 2021 and 2022).

3. Environmental Setting

This section describes the area of interest for the NMED PFAS Investigation project, located southwest of Clovis, New Mexico (Figure 1). The project area includes parts of Townships (T) 1 and 2 North, Ranges (R) 34, 35, and 36 East relative to the New Mexico Baseline and Principal Meridian, but is focused on the south half of T2N, R35E, and the north half of T1N, R35E (Figure 2).

3.1 Site Description

The Cannon site NMED PFAS project area is roughly bounded by the western Cannon AFB boundary on the west, U.S. Highway 70 (US 70) on the east, the Curry-Roosevelt County boundary on the south, and State Road 245 (SR 245) on the north. As shown in Figure 2, the project area encompasses all of Cannon AFB; most of the area outside of the base is occupied by a number of dairy farming operations with fields irrigated with center pivot sprinklers. Principal dairy operations in the project area are shown on Figure 2.

Primary residential areas in the project area are located along the north side of the area along east-west US 60. The residential areas include Chavez Manor (Cannon AFB base housing), Turquoise Estates, and Desert Ranch Mutual Domestic Water Consumers Association (MDWCA) (Figure 2).

4. Conceptual Site Model

This section describes the likely sources of PFAS contamination and exposure pathways at Cannon AFB.

4.1 Sources of Contamination

PFAS have been identified in soil, surface water, and groundwater at several AFFF release areas at Cannon AFB, most likely caused by the use of AFFF, which contained PFOS and PFOA, along with numerous other PFAS (ITRC, 2020). A total of 14 potential AFFF release areas have been identified at Cannon AFB (AFW, 2018).

4.2 PFAS Migration

Soil and groundwater data indicate that the most significant PFAS source areas are the former sewage lagoons and the North Playa Lake on the east side of Cannon AFB. While the firefighting training areas in the southeast portion of Cannon AFB are considered likely sources of PFAS, the groundwater flow direction and the distribution of PFAS in monitor wells in the southeast corner of the Base indicate that Landfill No. 5 is also a likely source of PFAS. PFAS have migrated through the vadose zone and impacted groundwater in the Ogallala Aquifer in and downgradient of these areas. Residual PFAS may have accumulated at the soil gas-sediment interface in the vadose zone under unsaturated flow conditions (Brusseau et al., 2019) that could provide a long-term source of contamination if not remediated.

Since the PFAS reached groundwater, these compounds have flowed with groundwater downgradient to the south and southeast of Cannon AFB. PFAS has likely migrated at the same rate as average groundwater flow in the Ogallala aquifer, with minimal adsorption onto aquifer materials. Based on Figure 14, a map developed by NMED (2020b), concentrations of total PFAS exceeding the 2016 EPA HA of 70 ng/L have been detected as much as 15,000 feet (approximately 3 miles) downgradient (east-southeast) of the Cannon AFB boundary. Figure 15, is based on a map issued by the USAF indicating potentially impacted groundwater in the downgradient direction (AFW, 2019). It is likely that PFAS movement in the Ogallala Aquifer has been affected by seasonal pumping of irrigation wells, creating increasing hydraulic gradients, southeast of Cannon AFB.

During 2021, the USGS collected at least 25 groundwater samples from 21 wells in the Clovis area (Figure 40). [Note: it is possible that the USGS also collected samples from locations where the well owner did not give permission to make the data public.] These 25 samples were part of a larger state-wide surface water and groundwater sampling effort conducted under contract to the NMED. The data, reviewed and approved by the USGS, were posted to the USGS NWIS and were downloaded from that website. The 25 samples were analyzed for 28 PFAS, and a subset were analyzed for metals and general water chemistry. The PFAS analyses were performed by Accutest Laboratories using EPA method 537 Modified (LM102 - PFAS SPE/LC/MS/MS EPA537M). The PFAS and general chemistry results are summarized in Tables 20 and 21, respectively. The locations of the 21 wells sampled by the USGS are shown on Figure 40.

PFAS were detected in water samples 4 wells, GS-2, GS-13, GS-15, and GS-18, with total PFAS concentrations ranging from 3.6 to 41.3 ng/L. PFOA and PFOS were not detected in any of the USGS samples. At GS-18, only PFCAs were detected; up to 3 PFCAs (PFBA, PFPeA, and PFHxA) and 3 PFSAs (PFBS, PFHxS, and PFPeS) were detected in each of the other 3 samples. Where both PFCAs and PFSAs were detected, PFCAs comprised between 59 and 76 percent of total PFASs. Two wells, GS-2 and GS-13, were sampled in January and October 2021, with the same PFAS detected at similar concentrations (Table 20). The concentrations of PFOS, PFOA, and PFHxS in water samples collected by the USGS are shown on Figure 41.

A total of 21 groundwater samples collected by the USGS were also analyzed for general field parameters (temperature, pH, dissolved oxygen, and specific conductance) and isotopes of oxygen and hydrogen. Only 9 samples from 8 locations were analyzed for major ions, metals, and other parameters identified in Table 21. Of the 9 samples, 3 were not analyzed for nitrogen compounds (ammonia, nitrate, nitrite). Sample GS-7 collected on May 12, 2021 was analyzed for nitrogen compounds and isotopes, but no other laboratory parameters. The general chemistry data for water samples collected by the USGS are provided in Table 21. The summary includes minimum, maximum, and average results for each parameter, as well as the number of samples analyzed and the number of samples detected.

6. NMED Phase I Investigation

This section presents the results of work performed by DBS&A during the NMED Phase 1 characterization and monitoring activities at the Cannon site. The scope of services included the following six tasks:

- Compiling and reviewing existing documents and data
- Preparing the necessary planning documents, including a work plan, SAP, and site-specific health and safety plan (HASP)
- Participating in a site visit to evaluate potential monitor well locations
- Performing the site characterization activities identified in the work plan and SAP
- Performing groundwater modeling using data derived from field activities (this work was not started during Phase 1)
- Preparing this Phase 1 progress report summarizing the results of the file review, field investigation, and groundwater monitoring, and presenting recommendations for Phase 2 activities

Each of these activities is described in the following subsections.

6.1 Existing Site Data

DBS&A has identified and compiled documents and data related to the PFAS investigations at Cannon AFB and the surrounding area, as discussed in Section 5. This has been an ongoing process as new references and new sources of such data are identified. DBS&A has stored all of the compiled materials in a searchable document index, which is updated as needed. Efforts to compile existing information are summarized in this section.

The USAF has issued several documents related to the PFAS investigations at Cannon AFB, including the *Preliminary Assessment Report* (HGL, 2015), the *Final Site Inspection Report* (AFW, 2018), the *Addendum 01 to the Final Site Inspection Report* (AFW, 2019), the *Final AFFF Release Areas Phase I Remedial Investigation Work Plan* (Bristol, 2021), and the *Aquifer Test Work Plan for the Pilot Study and Hydraulic Containment* (Brice-AECOM, 2021). These and many other documents related to environmental investigation and response activities conducted at USAF installations, including Cannon AFB, under the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), are publicly available at https://ar.afcec-cloud.af.mil, a website maintained by the USAF Civil Engineering Center (AFCEC). Some of these documents were provided to NMED and are publicly available at https://hwbdocuments.env.nm.gov/Cannon%20AFB/. The NMED site includes copies of many reports and correspondence related to historical soil, surface water, and groundwater investigations at Cannon AFB.

Analytical data from various sampling efforts for PFAS were identified and reviewed and are discussed in Section 5 of this report. Analytical data were obtained from the USAF PFAS reports listed above, the NMED PFAS Data website at https://www.env.nm.gov/pfas/data, and the USGS NWIS website. In addition, Mr. Arthur Schaap shared laboratory results from groundwater data samples collected from his property by himself and EPCOR. Mr. Schaap also gave his permission to use data from his property in this report.

Existing PFAS data reviewed related to PFAS contamination in the project area has been limited to the final SI report (AFW, 2018a), Addendum 1 to the final SI report (AFW, 2019), and spreadsheets of water sampling data for PFAS conducted by EPA, NMED, and NMDOH (NMED, 2019c).

Information on the geology and hydrogeology of Cannon AFB and the surrounding area were obtained from various reports prepared by the USGS, the New Mexico Bureau of Geology and Mineral Resources (NMBGMR), the Texas Bureau of Geology, the New Mexico Office of the State Engineer (OSE), and various consultants working for the USAF at Cannon AFB. The lithologic logs for the majority of deep soil borings, supply wells, and groundwater monitor wells at Cannon AFB were compiled and are provided in Appendix C. Driller's logs for more than 300 off-site wells were compiled from records on the OSE water rights website.

6.2 Planning Documents

Prior to the site visit, DBS&A prepared an SAP for sampling of groundwater at Cannon AFB (DBS&A, 2021). The SAP was prepared as a combination quality assurance project plan (QAPP) and field sampling plan (FSP) to detail sample collection procedures and analytical methods for the characterization and monitoring of PFAS on and in the vicinity of Cannon AFB. These two standard deliverables were combined into one document to streamline the planning process, while ensuring that data collected were of sufficient quality for their intended use.

6.3 Site Visit

DBS&A conducted a site visit to the Cannon-Clovis area on June 10 and 11, 2021. NMED was not able to participate in the site visit. The site visit did not include Cannon AFB. During the site visit, DBS&A personnel met with several landowners and their environmental consultants to discuss the scope of the NMED PFAS investigation project and to obtain access for sampling of irrigation wells located downgradient of Cannon AFB.

DBS&A conducted a second site visit to the Cannon-Clovis area on October 6, 2021 to visit Cannon AFB. Environmental personnel escorted DBS&A personnel on-base and toured the locations of each of the groundwater monitor wells to be sampled. Base access and logistics related to the sampling event were discussed.

6.4 Field Activities

To achieve NMED's Objective 2 and to contribute to the achievement of NMED's Objective 1 (Section 1.2), DBS&A identified the locations of existing irrigation and residential wells downgradient of Cannon AFB that were known to be contaminated or are at risk of becoming contaminated. During the June 2021 site visit, DBS&A obtained landowner permission to access their property and collect water samples from selected wells downgradient of Cannon AFB.

On December 7, 2021, DBS&A obtained a signed access agreement (Appendix J) from Mr. Juan Jimenez allowing for the installation and sampling of a monitor well (DBS-1) on his property. The OSE well permit for DBS-1 (CC-02631 POD1) was issued on December 28, 2021. DBS-1 was installed February 8 through 26, 2022 and sampled on February 27, 2022, as discussed in Section 6.5.

Field activities were conducted in accordance with the SAP approved by NMED (DBS&A, 2021), and with the NMED Remediation Oversight Section State Cleanup Program (SCP), outlined in 20.6.2 NMAC. All field activities were performed in accordance with the HASP (Appendix A of the SAP [DBS&A, 2021]).

6.4.1 Data Confidentiality

As mentioned in Section 1.3, with the exception of Mr. Arthur Schaap, owner and operator of Highland Dairy, and Mr. Juan Jimenez, on whose property new downgradient monitor well DBS-1 was installed, the landowners downgradient of Cannon AFB did not give permission for the results of the water sampling to be included in this report. Copies of the laboratory results have been sent to the owners of the properties from which they were obtained. The locations of the off-site wells sampled by DBS&A are shown on Figure 42, but the discussion of the results is limited to those samples from the Schaap and Jimenez properties. The laboratory reports for off-site sampling are provided in Appendix I, but include only the results from the Schaap and Jimenez properties.

6.4.2 Sample Handling and Analytical Methods

NMED contracted directly with Hall Environmental Analysis Laboratory (HEAL) in Albuquerque for laboratory analysis of sediment, surface water, and groundwater samples from the Cannon site. HEAL subcontracted with Vista Analytical (Vista) in El Dorado Hills, California, for the analysis of samples for PFAS. Sample containers with appropriate preservatives were provided by HEAL. Upon collection, all samples were placed on ice in dedicated sample coolers and shipped to HEAL under appropriate chain-of-custody. HEAL separated the sample volumes for PFAS analysis and forwarded those containers to Vista.

Vista analyzed sediment, surface water, and groundwater samples for 29 PFAS using either EPA methods 533 and 537.1M-ID. HEAL analyzed surface water and groundwater samples for total organic carbon (TOC), total Kjeldahl nitrogen (TKN), dissolved nitrate-nitrite, dissolved major anions and cations, and dissolved metals, including aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, vanadium, and zinc. The laboratory reports for sediment, surface water, and groundwater samples analyzed by HEAL and Vista are provided in Appendix I. The results of laboratory analyses for PFAS and general chemistry are discussed in the following sections.

6.4.3 Off-Base Water Sampling

The locations of the 28 pre-existing wells downgradient (east and southeast) of Cannon AFB that were sampled by DBS&A and monitor well DBS-1 are shown on Figure 42. The locations of wells from which the data generated are being held as confidential have been grayed out. By agreement with the landowners, we are prevented from presenting and discussing all of the data generated and illustrating the current boundaries of the PFAS groundwater plume.

Of the 29 wells sampled, 7 are located on Mr. Schaap's properties and 1, DBS-1, is on Mr. Jimenez's property. The results for 3 PFAS regulated by the State (PFOA, PFOS, and PFHxS) are shown for samples from the Schaap and Jimenez properties on Figure 43. The laboratory results for PFAS analysis of the samples from these 8 locations are provided in Table 22.

Of the 29 wells sampled, PFAS were not detected in 8 wells. The results from DBS-1 are discussed below. Total PFAS concentrations detected in the remaining 20 wells ranged from 1.8 ng/L at location COS-22, on the Schaap property, to 37,732.87 ng/L at well COS-11, also on Schaap property and identified by Mr. Schaap as well W-5 (discussed in Section 5.4). Also, for the 20 wells where PFAS were detected, PFSAs generally comprise more than half of the total PFAS detected.

PFOA was detected in groundwater samples collected from 12 wells at concentrations ranging from 8.5 ng/L to 2,300 ng/L, with samples from 5 wells exceeding the 2016 EPA HA of 70 ng/L. Of these wells, 2 were located on Schaap properties. PFOS was detected in samples from 13 wells at concentrations ranging from 3.02 to 15,100 ng/L with samples from 8 wells exceeding the 2016 EPA HA of 70 ng/L. Of these wells, 3 are on Schaap properties. Samples from 8 wells exceeded the 2016 HA for PFOA+PFOS combined. PFHxS was detected in samples from 19 wells at concentrations ranging from 1.77 to 11,400 ng/L.

Looking specifically at the data for the 7 wells sampled on the Schaap properties, no PFAS were detected in 1 sample (COS-20), and 1 sample (COS-22) contained only PFHxS at a very low level (estimated at 1.8 ng/L) (Table 22). Total PFAS concentrations in the groundwater samples from the other 5 Schaap wells ranged from 1.8 ng/L at location COS-22 to 37,732.87 ng/L at well COS-11, also identified by Mr. Schaap as well W-5 (discussed in Section 5.4). In the Schaap wells, up to 6 PFCAs, 5 PFSAs, and 3 FTSAs were detected.

PFOA was detected in samples from 4 of the 7 Schaap wells that were sampled, at concentrations ranging from 16.6 to 2,300 ng/L; concentrations in samples from 3 wells exceeded the 2016 EPA HA for PFOA of 70 ng/L (Table 22). PFOS was detected in samples from 5 of the Schaap wells that were sampled, at concentrations ranging from 3.02 to 15,100 ng/L; concentrations in samples from 3 wells exceeded the 2016 HA for PFOS of 70 ng/L. Samples from 3 wells exceeded the 2016 EPA HA for PFOA+PFOS combined. PFHxS was detected in samples from 6 of 7 Schaap wells, including the maximum concentration of 11,400 ng/L detected in off-base wells.

Well COS-11 (aka W-5), which is on Mr. Arthur Schaap's property and is located just to the south of Cannon AFB monitor well MW-D, has been sampled for PFAS at least four times between 2018 and 2022. Mr. Schaap sampled the well in September 2018. EPCOR sampled the well in March and June 2021 (and possibly at other times). DBS&A sampled the well in July 2021 (as COS-11). The results of previous (2018) PFAS analyses of well W-5 are provided in Table 15. The concentrations and proportions of the major PFCAs (PFBA, PFPeA, PFHxA, PFHpA, and PFOA) and the major PFSAs (PFBS, PFPeS, PFHxS, and PFOS) are depicted in Figures 44a and 44b, respectively.

The changes in PFAS concentration and distribution that occurred from the first sample in September 2018 to the most recent groundwater sample in July 2022 (based on the results from the primary sample, not the duplicate sample) include the following:

- Total PFAS concentration increased by about 25 percent, from 30,125.9 ng/L to 37,732.87 ng/L.
- Total PFCAs concentration decreased by 17.5 percent, from 9,588 ng/L to 7,910.8 ng/L. PFOA concentration decreased by more than 21 percent, from 2,920 ng/L in 2018 to 2,300 ng/L in July 2021. PFPeA and PFHxA concentrations decreased by more than 31 percent and nearly 16 percent, respectively.
- Total PFSAs concentration increased by 27 percent, from 20,501 ng/L to 26,009 ng/L. PFOS concentration increased from 11,400 ng/L in 2018 to 15,100 ng/L in the most recent sample—an increase of more than 32 percent. PFHxS concentration increased by nearly 9 percent, from 8,530 ng/L to 9,260 ng/L.
- FTSAs were not analyzed for in 2018, but from March 2021 to July 2021, concentration of the FTSA, 6:2 FTS, decreased by 15 percent, from 4,400 ng/L to 3,740 ng/L. Concentrations of the other 2 FTSAs analyzed for decreased by about 14 to 19 percent.

There is variability in some of the results from the 3 groundwater samples collected in 2021 (illustrated by Figures 44a and 44b), and even between the primary and duplicate groundwater samples collected in July 2021. Additional data are needed to determine whether concentrations are increasing or decreasing (e.g., using a statistical analysis), and to further characterize PFAS mass and mass flux in the Ogallala aquifer.

A groundwater sample was also collected from monitor well DBS-1, which was installed in February 2022 as part of this project (Figure 43). The monitor well was sampled following well development, using the pump that had been used for development, after field parameters stabilized. The laboratory results for PFAS analysis of the groundwater sample are included in Table 22. PFBA was the only PFAS detected in the sample from DBS-1. PFBS was detected at an estimated concentration of 2.18 ng/L (this value was flagged with a J qualifier, meaning that, while PFBA was positively identified in the sample, the concentration was below the laboratory reporting limit and was qualified by the laboratory as being an estimated concentration). Additional sampling of DBS-1 will be conducted during Phase 2 of this project in FY2023 to confirm the detection of PFBA and absence of other PFAS.

Groundwater samples from the off-base wells were also analyzed for general chemistry, including dissolved major cations and anions, dissolved metals, TOC, total dissolved solids (TDS), and total carbonate alkalinity. The results of the laboratory general chemical analyses of the

samples from the Schaap properties and well DBS-1 are provided in Table 23. The redacted laboratory reports are included in Appendix I. Following is a summary of the results:

- Specific conductivity ranged from 610 to 1,100 microsiemens per centimeter (µS/cm).
- TOC was generally not detected (i.e., less than 1 mg/L) in the irrigation well samples, but the TOC concentration was 17 mg/L in the sample from DBS-1.
- TDS concentrations ranged from 358 to 684 mg/L and averaged about 459 mg/L.
- Dissolved fluoride concentrations in all samples ranged from 1.6 to 2.5 mg/L, with 8 samples exceeding the MCL of 1.6 mg/L, which appear naturally high.

6.4.4 Split Sampling of Cannon AFB Monitor Wells

In December 2021, DBS&A obtained groundwater sample splits and groundwater elevation measurements from 16 monitor wells at Cannon AFB. Groundwater samples obtained from monitor wells at Cannon AFB were collected using dedicated sampling bladder pumps in each well. Depth to water was measured in each of the monitor wells at Cannon AFB on December 8 and 9, 2021. Each well was purged and sampled following micropurge sampling procedures. Measuring water levels and water quality field parameters and purging and sampling of each monitor well was performed by personnel from Bristol Environmental Solutions, LLC (Bristol) in accordance with the long-term groundwater monitoring plan for Cannon AFB (FPM and AECOM, 2022). Water level measurements and final water quality field parameters (temperature, pH, electrical conductivity, oxidation/reduction potential, dissolved oxygen, and turbidity) measured prior to collecting each sample are provided in Table 24.

A potentiometric surface map created by DBS&A using the water level measurements from December 8 and 9, 2021 is provided as Figure 45. The data indicate that groundwater flow direction on the west side of Cannon AFB is generally to the east. In the north and northwest parts of Cannon AFB, groundwater flow is mostly to the southeast toward the WWTP, and becomes more southerly around the North Playa Lake. In the southeast portion of Cannon AFB, groundwater flow is to the southeast. This map is in good agreement with water table maps created by consultants for the USAF and included in Appendix E.

The locations of the monitor wells at Cannon AFB are shown on Figure 45. All of the wells sampled are located on the east side or southeast corner of Cannon AFB. These wells are referred to in Section 5.3.4 as the east monitor wells and the southeast monitor wells, and are discussed separately.

6.4.4.1 *East Monitor Wells*

Groundwater sample splits were obtained from a total of nine monitor wells in the area around the WWTP, the former Sewage Lagoons, and the North Playa Lake (Figure 46). The results of laboratory analysis of groundwater samples for PFAS from the east monitor wells obtained by DBS&A in December 2022 are provided in Table 25a.

During the 2017 groundwater sampling (AFW, 2018), no PFAS were detected in wells MW-E, MW-N, or MW-W. Only 1 PFAS (PFHxA) was detected in the sample from well MW-Rb, and only 2 PFAS (PFHxA and PFHxS) were detected in the sample from well MW-Fa (Table 11a). In 2021, no PFAS were detected in DBS&A's samples splits from wells Na or W. PFAS were detected in the other 7 wells in the east area, ranging from 4.7 ng/L in well Pa to 854.47 ng/L in well H.

There have been significant changes in total PFAS concentrations in the east monitor wells from 2017 to 2022. Total PFAS concentrations declined by an average of 90 percent in wells Fa, Ga, Oa, and Pa. Most notably, total PFAS concentration in well Ga decreased from 1,506 ng/L in 2017 to 104.09 ng/L in 2022. Total PFAS concentration in well Oa decreased from 1,029.6 ng/L in 2017 to 135.05 ng/L in 2022. Total PFAS concentration in well Pa decreased from 926.6 ng/L in 2017 to 4.72 ng/L in 2022. PFAS concentrations increased in 3 wells, with the total PFAS concentration in well H increasing from 252.4 ng/L in 2017 to 854.47 ng/L in 2022.

PFOA concentrations ranged from non-detect in 6 of 9 wells in 2022, with a maximum detection of 25.9 ng/L in well H, well below the 2016 HA of 70 ng/L (Table 25a). PFOS was not detected in 7 of 9 wells in 2022, with a maximum concentration of 185 ng/L in well H. Only well H exceeded the 2016 HA for PFOS and PFOA+PFOS combined.

Groundwater quality samples from the east monitor wells were also analyzed for general chemistry, including major ions, dissolved metals, TOC, TDS, and total carbonate alkalinity. The results of the laboratory general chemical analyses of the samples from the east monitor wells are provided in Table 25b. The laboratory reports are included in Appendix I. Following is a summary of the results:

- Specific conductivity ranged from 680 to 1,200 µS/cm.
- TOC was not detected (i.e., less than 1 mg/L).
- TDS concentrations ranged from 426 to 800 mg/L, and averaged 543 mg/L.
- Nitrate plus nitrite as nitrogen was non-detect in well MW-W (less than 1 mg/L), but was detected in all other east monitor wells, at concentrations ranging from 1.8 to 2.2 mg/L.

- Dissolved fluoride was detected in all samples at concentrations ranging from 0.6 to 2.2 mg/L, with fluoride concentrations in 8 of 9 samples exceeding the MCL of 1.6 mg/L.

6.4.4.2 Southeast Monitor Wells

Groundwater quality sample splits were obtained from a total of 7 monitor wells in the southeast corner of Cannon AFB in the area southeast of the active FTA and the former FTAs, as well as Landfill No. 5 (Figure 46). The results of laboratory analysis of groundwater samples for PFAS from the southeast monitor wells obtained by DBS&A in December 2022 are provided in Table 25a.

During the 2017 groundwater sampling (AFW, 2018), low levels of PFHxA and PFBS were detected in monitor well MW-A, which is about 3,000 feet northwest of the southeast corner of Cannon AFB. At that time, PFOA was detected in the six wells at the southeast corner of the base, ranging from 10 ng/L at well Ua to 2,800 ng/L in a duplicate sample from well D. PFOA concentrations in wells Ca, D, Sa, and Ta exceeded the 2016 HA of 70 ng/L. PFOS concentrations ranged from 150 ng/L at well Sa to 24,000 ng/L at well Ca, and were non-detect in wells Ta and Ua. PFOS concentrations in wells Ca, D, and Sa exceeded the 2016 HA of 70 ng/L.

As observed in the east monitor wells, the concentrations of total PFAS have declined in each of the wells in the southeast corner of Cannon AFB. At well Ca, total PFAS concentrations declined from 56,504 ng/L in 2017 to 43,332.6 ng/L in 2022—a decrease of 23.3 percent. Total PFAS concentration in well Sa decreased from 9,293.6 ng/L in 2017 to 1,474.5 ng/L in 2022—a decrease of 84.1 percent. Total PFAS concentration in well Ta decreased from 2,088 ng/L in 2017 to 89 ng/L in 2022—a decrease of nearly 96 percent. The highest concentrations of PFAS continue to be found in wells Ca and D along the southern boundary of Cannon AFB.

In the 2022 samples, PFOA was detected in 3 of the 6 wells in the southeast corner of Cannon AFB, down from 6 of 6 wells in 2017. PFOA concentrations ranged from 124 ng/L at well Sa to 1,800 ng/L at well D, with concentrations in all three wells exceeding the LHA. PFOS was detected in 2 wells, down from 4 wells in 2017. PFOS concentrations in well Ca (20,800 ng/L) and well D (2,190 ng/L) exceed the LHA.

Groundwater quality samples from the southeast monitor wells and well MW-A were also analyzed for general chemistry, including dissolved major cations and anions, dissolved metals, TOC, TDS, and total carbonate alkalinity. The results of the laboratory general chemical analyses of the samples from the southeast monitor wells are provided in Table 25b. The laboratory reports are included in Appendix I. Following is a summary of the results:

- Specific conductivity ranged from 360 to 890 µS/cm.
- TOC was not detected (i.e., less than 1 mg/L).
- TDS concentrations ranged from 216 to 490 mg/L, and averaged about 391 mg/L.
- Dissolved fluoride was detected in all samples at concentrations ranging from 2.0 to 6.8 mg/L, with fluoride concentrations in all 7 samples exceeding the MCL of 1.6 mg/L.
- Nitrate plus nitrite as nitrogen was non-detect in well MW-A (less than 1 mg/L), but was detected in all other southeast monitor wells, at concentrations ranging from 1.0 to 2.4 mg/L and averaging 1.4 mg/L.

6.4.5 Laboratory Data Review

The data quality assessments for the sampling performed under this contract are provided in Appendix K. Data collected during the NMED Phase 1 PFAS investigation were found to meet quality objectives.

6.5 Monitor Well Installation and Sampling

DBS&A installed 1 groundwater monitor well during Phase 1 of the NMED PFAS investigation at the Cannon site. Thorough site characterization is a critical step toward implementing a remedial strategy. DBS&A used a phased approach to the installation and sampling of the new groundwater monitor well at the distal end of the PFAS plume. The final location of the new monitor well was selected after the results of the water quality sampling were reviewed.

The new monitor well, designated DBS-1, is located approximately 5.5 miles east-southeast of the southeast corner of Cannon AFB in the northeast quarter of the southeast quarter of Section 1, T1N, R35E, as shown on Figure 41. This property is owned by the Jimenezes of Clovis. Permission to install a groundwater monitor well was granted by Mr. Juan Jimenez on December 7, 2021, and the OSE well permit was issued on December 28, 2021. Copies of the access agreement and the OSE well permit are provided in Appendix J.

Drilling of well DBS-1 began on February 8, 2022, and the well was completed on February 26, 2022. Drilling, installation, and development of the monitor wells was performed by Yellow Jacket Drilling Services of Phoenix, Arizona. The boring was advanced to a depth of 375 feet bgs in the Ogallala Formation using sonic drilling techniques, with continuous core samples collected from surface to total depth. The well was drilled without using any drilling additives

except potable water, which was obtained from a City hydrant in Clovis. The core samples were logged by a DBS&A geologist. The DBS-1 lithologic log is provided in Appendix J.

A total of 4 soil samples were collected for laboratory analysis during installation of monitor well DBS-1. Samples were collected at the surface (0.0 to 0.5 feet bgs), 5.0 to 5.5 feet bgs, 335 feet bgs (a duplicate sample was also collected at this depth), and 340 feet bgs and submitted to HEAL for laboratory analysis of PFAS and general chemistry, as described in Section 6.4.2. There were no PFAS detections in the soil samples. A total of 8 equipment rinsate (aqueous) samples were collected to sample the water that was used to rinse the core barrels used for soil sampling. Of these equipment rinsate samples, 3 had PFAS detections that were below laboratory reporting limits and were qualified by the laboratory as being estimated concentrations.

There were no PFAS detections in other 5 equipment rinsate samples. The well was completed using 5-inch-diameter, flush-threaded Schedule 80 blank polyvinyl chloride (PVC) casing to a depth of 333 feet bgs and 35 feet of Schedule 80 factory-slotted PVC well screen with 0.020-inch slots set from 333 to 368 feet bgs. The well screen was set with approximately 5 feet of screen above the water table and 30 feet below the water table. The well has a 5-foot-long sump and end cap below the screen to capture any sediment that might enter the well. Stainless steel well centralizers were connected to the well casing at approximately 20-foot intervals below 310 feet bgs and at 60-foot intervals from 310 feet bgs to the surface. A filter pack composed of 20/40 silica sand was emplaced using a tremie pipe from the bottom of the boring at 375 feet bgs up to 328 feet bgs, 5 feet above the top of the well screen. A 5-foot-thick bentonite seal was emplaced from 328 to 323 feet bgs, and high-solids bentonite grout was emplaced from 323 to 50 feet bgs. The top 50 feet of the hole was sealed with a cement/ bentonite grout. The well is secured with a locking cap inside a protective well vault that is set in 4-inch-thick concrete pad. The well construction diagram is included in Appendix J.

Depth to water was measured at 338 feet bgs after the well was completed on February 26, 2022. Approximately 24 hours after the well installation was complete, the well was developed to remove sediment from the well casing, using a combination of bailing, surging, airlifting, and pumping. Development activities continued until the water produced was sediment free and substantially clear.

Investigation-derived waste, including soil cores and well development water, were containerized for off-site disposal.

The location and elevation of the top of the protective well vault and the measuring point elevation on the north edge of the PVC well casing were surveyed by a professional surveyor licensed in the State of New Mexico. The survey report is provided in Appendix J. As discussed in Section 6.4.3, a groundwater sample was collected from DBS-1 on February 27, 2022. The monitor well was purged and sampled following well development, using the pump that had been used for development, and the sample was collected after the field parameters stabilized. The laboratory results for PFAS analysis of the groundwater sample are included in Table 22. PFBA was the only PFAS detected in the sample from DBS-1. PFBS was detected at an estimated concentration of 2.18 ng/L. While PFBA was positively identified in the sample, the concentration was below the laboratory reporting limit and was qualified by the laboratory as being an estimated concentration. Additional sampling of DBS-1 will be conducted during Phase 2 of this project to confirm the detection of PFBA and absence of other PFAS.

A dedicated QED pump was purchased for DBS-1 during FY2022, and will be installed during FY2023.

The data quality assessments for the sampling associated with the installation and sampling of DBS-1 are provided in Appendix K. Data were found to meet quality objectives.

7. Conclusions and Recommendations

The results of sampling for PFAS conducted by various parties in the Cannon site area indicate that releases of PFAS have occurred from multiple sources at Cannon AFB, which likely include (1) one or more of the FTAs located in the southeast quarter of the Base, (2) the former Sewage Lagoons, located on the east side of the base south of the current WWTP, (3) one or more of the former landfills, such as Landfill No. 5 located in the southeast corner of the base, and (4) current wastewater discharge areas, such as the ponds and irrigated areas at the golf course and the North Playa Lake.

Two main areas of PFAS contaminated groundwater have been identified at Cannon AFB: the area southeast of the former Sewage Lagoons and the area south and southeast of Landfill No. 5. NMED's PFAS data from December 2021 groundwater sampling at Cannon AFB indicate that PFAS concentrations in most of the so-called east monitor wells have decreased dramatically since the USAF SI in 2017 and 2018. PFAS concentrations in groundwater in the southeast corner of the base have also declined, but high concentrations there indicate an ongoing source that presents a continuing threat to residential and agricultural wells

downgradient of Cannon AFB. Additional investigation is required to determine the source(s) of PFAS impacts at Cannon AFB and what steps can be taken to stop what appear to be ongoing impacts to groundwater. Based on previous PFAS detection in soils (Section 5.3.1), further characterization and remediation of PFAS-contaminated soils at and near Cannon AFB is required to address short- and long-term contamination of groundwater in the Ogallala aquifer system.

The USAF is currently conducting an RI of PFAS contamination at Cannon AFB and downgradient of the base, as described in Section 5.3.7. The first phase of the RI is occurring on-base, but the EPA-approved work plan (Bristol, 2021) indicates that substantial work will be conducted off-base. The ongoing RI should be factored into NMED's plans for additional PFAS investigation.

The FY2023 Cannon site PFAs investigation project objectives will include the following:

- Establish a technical dialogue between NMED, USAF, and EPA to determine the nature and extent of USAF's plans for off-site investigation, and to coordinate efforts.
- Ensure that PFAS-contaminated soils are characterized and remediated to address what appear to be ongoing impacts to groundwater.
- Establish a regular and comprehensive groundwater monitoring program.
- Provide better definition of existing groundwater plume geometry (PFAS isoconcentration maps and cross sections) and modeled predictions of future plume migration, including empirically derived rates of movements of PFAS contaminants in the subsurface.

Specific recommendations for Phase II project activities to be conducted during FY2023 at the Cannon site are as follow:

- Conduct analytical and/or numerical modeling activities to assess groundwater flow and PFAS transport and to better define the nature and extent of PFAS contamination at the Cannon site.
- USAF and NMED exchange of copies of complete laboratory reports for sediment and groundwater samples collected from Cannon AFB. NMED should provide the USAF with copies of laboratory reports for sediment and groundwater samples collected from new monitor well DBS-1. To the extent possible, NMED should also provide USAF with copies of laboratory results from the 2021 off-base sampling (i.e., from the Schaap property, with Mr. Schaap's approval).

- Obtain monthly or quarterly progress reports on activities associated with the USAF RI from the USAF or EPA, including access to preliminary data. The USAF RI report documenting the results of the investigation will likely not be prepared for some time (perhaps 2023 or later). Therefore, NMED should coordinate with USAF to obtain characterization data for PFAS-contaminated sediment in the vadose zone, and groundwater sample splits from new and existing monitor wells. NMED should also consider where additional groundwater monitor wells can be installed, and identify existing irrigation wells that may be monitored as "sentinel wells."
- Contact Mr. Schaap to determine if EPCOR continues to sample his well W-5, and obtain any other laboratory data that have been provided to him.
- Contact other downgradient landowners to determine whether they are conducting groundwater sampling for PFAS and if they are willing to share the results with NMED. Determine under what conditions the results of groundwater sampling on other properties can be used to delineate the extent of PFAS impacts.
- Contact landowners to obtain a better understanding of irrigation practices and types of crops being grown, as this information may apply to groundwater modeling efforts and movement of the PFAS plume in groundwater. Such information may include production rates for irrigation wells, and period of use.

Additional project activity recommendations for the Cannon site include conducting investigations to determine or quantify the following:

- Requesting that EPA issue a 104(e) Request to Cannon AFB/USAF for Information to produce all records regarding the purchase, storage, and use of AFFF, including chemical composition, mixing instructions, disposal of empty containers. This information would inform the total mass and chemical composition of AFFF used at and released from Cannon AFB.
- Obtain information from the USAF regarding their PFAS RI investigation and plans to remediate residual PFAS stored in the vadose zone in proximity to known PFAS release sites at Cannon AFB. Characterization and remediation of PFAS-contaminated sediment in the vadose zone is needed in order to stop what appear to be ongoing impacts to groundwater.
- Once the USAF data for the RI are available, construct isopleth maps of individual PFAS distributed in sediment and groundwater vertically and laterally at Cannon AFB or assess USAF maps, if already completed.

- Quantify the mobility of individual PFAS in the Ogallala aquifer at Cannon AFB and, to the extent practicable, along the PFAS plume migrating downgradient to the east-southeast.
- To the extent practicable, quantify mass and mass flux of individual PFAS that have migrated downgradient from Cannon AFB beneath privately owned property (landowner permission would be needed to publish these data).
- To the extent practicable, construct cross sections of individual PFAS showing vertical distributions along the axis (depth) and transverse (width) to the entire plume length (landowner permission would be needed to publish these data).

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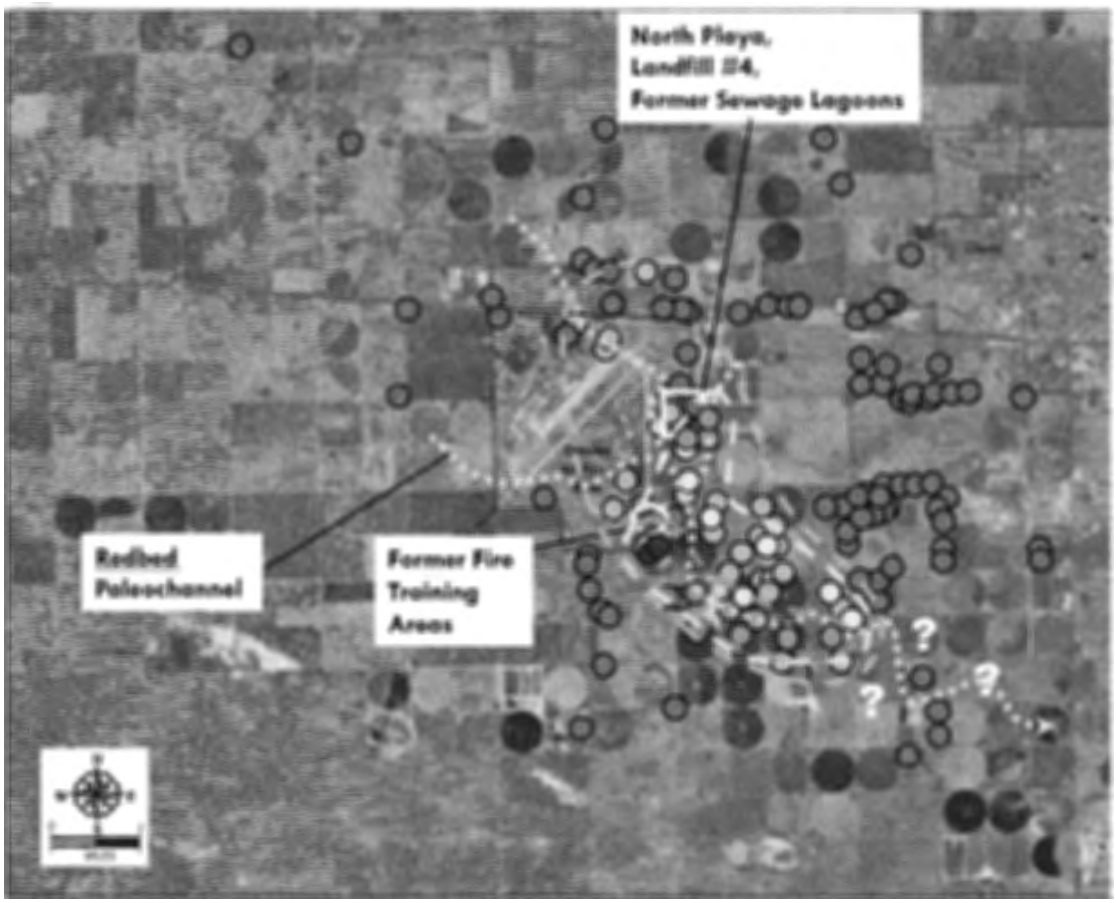

Source: NMED RFP #21 667 1210 0001, Amendment #2

Total PFAS (ng/L)

- > 10,000
- 1,000 to 9,999
- 71 to 999
- 1 to 70
- Not Detected

Note: Variability in detection locations may result from differences in laboratory detection, quantification, and reporting limits.

Figure 14

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NMED PFAS INVESTIGATION, CANNON AFB
NMED Map of Cannon AFB PFAS Plume from NMED (2020)

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NMED PFAS INVESTIGATION, CANNON AFB
Cannon AFB AFFF Release Areas

Figure 18

Table 6. AFFF Release Sites at Cannon AFB
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AFFF Area No.	AFFF Area Name	Description
1 (Figure 19)	Former Fire Training Area (FTA) No. 2	Unlined FTA used twice per quarter from 1968 to 1974 with use of an unknown volume of AFFF likely from 1970 to 1974. Since about 1970, FTA procedures at Cannon AFB have been to "presaturate the ground surface with water, apply the starter fuel, ignite, preburn for 30 to 45 seconds, and extinguish with AFFF" (HGL, 2015 PF226).
2 (Figure 20)	Former FTA No. 3	Unlined FTA used twice per quarter from 1968 to 1974 with use of an unknown volume of AFFF likely from 1970 to 1974.
3 (Figure 21)	Former FTA No. 4	Unlined FTA used twice per quarter from 1974 through 1995 with use of an unknown volume of AFFF likely during that period. Prior to 1985, runoff from training exercises drained to an unlined pit. In 1985, a lined pit with an oil/water separator (OWS) was installed to handle runoff.
4 (Figure 22)	Hangars 119 and 133	A "large quantity" of AFFF was released from Hangar 119 during "multiple" accidental releases. Likely that releases reached grassy areas outside the hangars and storm drains on the flight ramp outside the bays that channel runoff "directly to the South Playa Lake." Two AFFF releases occurred from Hangar 133. In December 2000, several hundred gallons of AFFF entered a nearby storm drain, which likely routed to the South Playa Lake. In July 2001, approximately 200 gallons of AFFF was released. Some was washed to a floor trench and routed to the WWTP, and some was washed to nearby infield soil and allowed to disperse."
5 (Figure 23)	Former Sewage Lagoons	Two unlined surface impoundments were used from 1966 and 1998 to hold sanitary and industrial waste from the Base before the WWTP was constructed. Any AFFF that entered the sanitary sewer before 1998 went to the lagoons, such as the documented releases from the hangars.
6 (Figure 24)	North Playa Lake Outfall	This playa lake, which is likely unlined, received all sanitary and industrial waste from the Base from 1943 to 1966. It is unclear whether the North Playa Lake received any discharges from 1966 to 1998, but it currently receives treated effluent from the WWTP. Since the WWTP does not effectively remove PFAS from wastewater, the North Playa Lake continues to receive effluent containing PFAS.
7 (Figure 25)	South Playa Lake Outfall	Since 1943, any stormwater or wastewater containing AFFF that enters storm drains near the flightline is routed to the South Playa Lake. Several releases of AFFF from hangars entered nearby storm drains and were routed to the lake.

Sources: HGL, 2015 PF226; AFW, 2018 PF20

Table 6. AFFF Release Sites at Cannon AFB
Page 2 of 2

AFFF Area No.	AFFF Area Name	Description
8 (Figure 26)	Golf Course Outfall	Since 2002, treated effluent from the WWTP has been used to irrigate the golf course and fill two ponds on the course. As noted above, the WWTP does not effectively remove PFAS from the influent so the effluent contains PFAS. Sampling found PFAS in samples of WWTP influent and effluent in 2019.
9 (Figure 27)	Hangar 109	Recent release of AFFF inside the hangar/mechanical rooms escaped the building and drained to grassy areas outside the hangar.
10 (Figure 28)	Active FTA	Waste liquids from monthly training exercises at the active FTA are collected in a lined evaporation pond and allowed to evaporate. The pond has required repairs in the past, but any damage to the liner could result in AFFF being released to environment. An extreme flood event in May 2015 likely caused the evaporation pond with residual AFFF to overflow and infiltrate into surrounding soil.
11 (Figure 29)	Landfill No. 4	Located immediately north of North Playa Lake, the landfill cover was irrigated with water from North Playa Lake, which holds wastewater effluent from the WWTP containing PFAS.
12 (Figure 30)	Perimeter Road Fuel Spill	A large amount of AFFF was sprayed from crash fire trucks onto a fuel spill associated with an overturned tanker trunk on the southeast side of Perimeter Road. The response occurred over several days. Affected soils were reportedly excavated, but the extent of excavation is not known.
13	Flightline Crash Areas	An unknown amount of AFFF was released in response to three separate crashes along the flightline where AFFF was released during crash response activities.
14	Basewide Groundwater	According to AFW (2018 PF20), "groundwater was evaluated for all identified AFFF release areas." However, groundwater monitor wells have not been installed at most of the AFFF release sites. The USAF has identified a separate AFFF release area (Release Area 14) for evaluating the presence of PFAS in basewide groundwater.
—	Hangar 204	An accidental release of approximately 700 gallons of AFFF occurred inside this aircraft storage and maintenance hangar in May 2002. The AFFF release flowed onto the nearby concrete ramp and was left to disperse.

Sources: HGL, 2015; AFW, 2018

Appendix A

Notice to Proceed

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau

1190 St. Francis Drive / PO Box 5469
Santa Fe, NM 87502-5469
Phone (505) 827-2900 Fax (505) 827-2965
www.env.nm.gov

Michelle Lujan Grisham
Governor

Howie C. Morales
Lieutenant Governor

James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

February 9, 2021

Mr. John R. Bunch, PG
Daniel B. Stephens & Associates, Inc.
6020 Academy Road NE, Suite 100
Albuquerque, NM 87109
Sent via email: jbunch@geo-logic.com

Re: Notice to Proceed – Phase I Remedial Investigation in the Vicinity of Cannon Air Force Base, Curry County, and Holloman Air Force Base, Otero County, New Mexico
Contract #21-667-1210-00002

Dear Mr. Bunch:

The New Mexico Environment Department (NMED) has reviewed the Technical and Cost Proposal submitted by Daniel B. Stephens & Associates, Inc., dated January 28, 2021 for the completion of a Phase I Remedial Investigation (RI) in the vicinity of Cannon Air Force Base, Curry County, and Holloman Air Force Base, Otero County, New Mexico. NMED approves the Technical and Cost Proposal for this project as follows:

Task and Cost Summary for Cannon Air Force Base

Task No.	Description	Cost
1	Site Data Review and Site Visit	$12,528.00
2	Planning Documents	$18,310.00
3	Sampling Existing Water Supply Wells	$14,231.00
4	Drilling and Well Installation	$266,944.62
5	One Year of Quarterly GW Monitoring	$62,260.00
6	Phase 1 Progress Report	$19,950.00
7	Modeling	$9,051.25
	Subtotal:	$403,274.87
	New Mexico Gross Receipts Tax @ 7.8750%	$31,757.90
	Total:	**$435,032.77**

Task and Cost Summary for Holloman Air Force Base

Task No.	Description	Cost
1	Site Data Review and Site Visit	$12,470.00
2	Planning Documents	$18,310.00
3	Sampling Existing Water Supply Wells and Surface Water	$9,840.00
4	Drilling and Well Installation	$156,212.00
5	One Year of Quarterly GW Monitoring	$38,852.00
6	Phase 1 Progress Report	$19,950.00
7	Modeling	$9,051.25
8	Waterfowl and Small Mammal Survey	$185,800.00
	Subtotal:	$450,485.25
	New Mexico Gross Receipts Tax @ 7.8750%	$35,475.72
	Total:	**$485,960.97**

NMED has assigned work order # DBSA-PFAS to this work. This work order is approved based on a time and materials cost not to exceed the amount shown in the above Cost Summary. Enclosed is a copy of the approved work order for your files. The total budget approved for this work order shall not exceed $921,000.00 including New Mexico Gross Receipts Tax. This work will be completed by June 30, 2021, however, uncompleted work tasks may continue during State of New Mexico fiscal years (FY) 2022, 2023, 2024, and 2025, if approved by the New Mexico Legislature.

Prior approval from the NMED project manager is required before budget may be moved from between tasks or different labor categories. The use of any staff or subcontractors not specified in the approved Contractor Fee Schedule must be pre-approved in writing by NMED. Additional costs due to changes in the written technical proposal or task assignment must be approved by NMED in writing before the additional work commences.

Prior to submitting an invoice, Daniel B. Stephens & Associates, Inc. must first submit a summary of tasks performed or deliverables produced during the billing period. NMED will issue an acceptance of this summary and request for an invoice for the costs incurred for the reported tasks or deliverables. Each summary and invoice must identify the work order number, NMED subaccount code, activity code, and contract number.

Any activities performed or completed pursuant to this Notice to Proceed must comply with any and all applicable federal, state, or local laws, including but not limited to any orders issued in relation to any Public Health Orders in relation to the COVID-19 virus.

Please contact Dr. Patrick Longmire at (505) 699-9015 or patrick.longmire@state.nm.us if you have any questions about this request.

Sincerely,

Michelle Hunter

Digitally signed by Michelle Hunter
Date: 2021.02.09 15:43:46 -07'00'

Michelle Hunter, Bureau Chief
Ground Water Quality Bureau

cc: Patrick Longmire, GWQB
Stephanie Stringer, Director, RPD
Chris Catechis, Deputy Director, RPD
Miquella Lopez, Financial Manager, RPD
GWQB Reading File

Exhibit 7

Phase 2 Investigation Report
NMED PFAS Investigation
Cannon Air Force Base and Surrounding Area

Prepared for

New Mexico Environment Department
Hazardous Waste Bureau
Santa Fe, New Mexico

Prepared by

DBS&A
a Geo-Logic Company

6020 Academy NE, Suite 100
Albuquerque, New Mexico 87109
www.dbstephens.com
DB23.1087

June 30, 2023

1. Introduction

To better understand the scope of potential and existing environmental contamination associated with per- and polyfluoroalkyl substances (collectively referred to as PFAS) around the state, the New Mexico Environment Department (NMED) has worked with state and federal partners to conduct sampling for PFAS in sediment, surface water, and groundwater around the state. The NMED Hazardous Waste Bureau (HWB) contracted with Daniel B. Stephens & Associates, Inc. (DBS&A) to characterize PFAS in groundwater on and in the vicinity of Cannon Air Force Base (AFB) in Curry County (the Cannon site). The Phase 1 work performed under this contract is discussed by DBS&A (2022). This report presents the results of the Phase 2 work conducted for the Cannon site between March and June 2023, including groundwater quality sampling, numerical modeling, and identifying recommendations for Phase 3 project activities.

2. Data Confidentiality

As discussed in the Phase 1 report (DBS&A, 2022), with two exceptions, the landowners downgradient of Cannon AFB gave permission to DBS&A to collect groundwater samples, but required that the results of the water sampling not be provided to NMED or included in the Phase 1 report. The exceptions were Mr. Arthur Schaap, owner and operator of Highland Dairy, and Mr. Juan Jimenez, on whose property new downgradient monitor well DBS-1 was installed. Copies of the laboratory results were sent to the owners of the properties from which the samples were obtained. The discussion of results in the Phase 1 report is limited to the samples from the Schaap and Jimenez properties. The laboratory reports for Phase 2 sampling during April 2023 are provided in Appendix A, and include the results from two downgradient domestic wells (without location information), as well as monitor well DBS-1.

3. Site Description

The NMED-directed Cannon site PFAS investigation project area is roughly bounded by the western Cannon AFB boundary on the west, U.S. Highway 70 (US 70) on the east, the Curry-Roosevelt County boundary on the south, and State Road 245 (SR 245) on the north. The project area encompasses all of Cannon AFB; most of the area outside of the base is occupied by a number of dairy farming operations and fields irrigated with center pivot sprinklers, with

some rural residences. The Ogallala Aquifer, also referred to as the High Plains Aquifer, is the primary source of potable water in the region, and provides the water supply for Cannon AFB, the City of Clovis, and the vicinity. Depth to groundwater is currently approximately 320 feet below ground surface (bgs) in the Cannon AFB area, and groundwater is unconfined. The local groundwater gradient is generally to the southeast at 0.0013 to 0.0028 foot per foot (ft/ft) (Hart and McAda, 1985).

Cannon AFB is located approximately 3 miles west-southwest of Clovis, New Mexico. It occupies 3,789 acres of federally owned land, and is the home of the Special Operations Air Force Base and the 27th Special Operations Force Support Squadron. Clovis is the largest city in eastern New Mexico, and is a principal center for trade and agricultural services for the region. The city is also a center for rail transportation, marketing livestock, and processing agricultural commodities, particularly grain, livestock, milk, and poultry. It is surrounded by thousands of acres of farming, ranching, and dairy land. The Cannon site Phase 1 PFAS investigation report (DBS&A, 2022) includes a thorough discussion of the environmental setting. A vicinity map showing Cannon AFB and the surrounding area is provided as Figure 1.

4. Background

PFAS are a large family (perhaps more than 8,000 [Buck et al., 2021]) of manmade organofluorine compounds that were developed in the early 1940s. Certain PFAS, such as perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), are mobile, persistent, and bioaccumulative, and are not known to degrade in the environment. PFAS chemical structure gives them unique and valuable properties, including the ability to reduce friction and make products more resistant to soil, stain, grease, water, fire, and temperature. These chemical properties make them useful components in a wide array of industrial and commercial applications, such as textiles and leather products, metal plating, the photographic industry, photolithography, semiconductors, paper and packaging, non-stick cookware, food packaging, waterproof clothing, fabric stain protectors, lubricants, and pesticides. Some PFAS are also used as high-performance surfactants in products where an even flow is essential, such as paints, coatings, cleaning products, and fire-fighting foams, such as aqueous film-forming foam (AFFF), for use on liquid (hydrocarbon) fuel fires (U.S. EPA, 2009 and 2021b).

PFAS are characterized by linear or branched carbon-fluorine chains connected to a functional group, and can vary in length from 4 to 14 molecules. The number of carbon atoms, and

work plan (Bristol, 2021) indicates that substantial work will be conducted off-base (DBS&A, 2022). The ongoing RI should be factored into NMED's plans for additional PFAS investigation.

The Phase 2 Cannon site PFAS investigation project objectives that were outlined in the Phase 1 report include the following:

- Establish a technical dialogue between NMED, USAF, and EPA to determine the nature and extent of USAF's plans for off-site investigation and to coordinate field and data collection efforts.
- Provide better definition of existing groundwater plume geometry and modeled predictions of future plume migration, including empirically derived rates of movements of PFAS contaminants in the subsurface.

Specific recommendations that were included in the Phase 1 report for Phase 2 project activities at the Cannon site included the following:

- Conduct analytical and/or numerical modeling activities to assess groundwater flow and PFAS transport, and to better define the nature and extent of PFAS contamination at the Cannon site.
- Obtain monthly or quarterly progress reports on activities associated with the USAF RI from the USAF or EPA, including access to preliminary data. The USAF RI report documenting the results of the investigation will likely not be prepared for some time. Therefore, NMED should coordinate with USAF to obtain characterization data for PFAS-contaminated sediment in the vadose zone and groundwater sample splits from new and existing monitor wells.

9. Phase 2 Project Activities

NMED did not issue a work order allowing DBS&A to initiate the Phase 2 PFAS investigation until spring 2023. Given that the fiscal year ends on June 30, 2023, it was not possible to accomplish the project objectives that were outlined in the Phase 1 report. This section summarizes the work conducted during the Phase 2 investigation.

9.1 DBS-1 Monitor Well Pump Installation

DBS&A installed one downgradient monitor well in Curry County during Phase 1 (DBS-1). A dedicated pump with certified PFAS-free tubing was purchased during Phase 1, and this pump was set in monitor well DBS-1 during Phase 2. This well was also resampled for PFAS (Section 9.2).

9.2 Groundwater Sampling

NMED contracted with Hall Environmental Analysis Laboratory (HEAL) in Albuquerque for laboratory analysis of groundwater samples for the Phase 2 investigation. HEAL subcontracted with Enthalpy Analytical (Enthalpy, formerly Vista) in El Dorado Hills, California, for the PFAS analysis. The same laboratory analyzed samples for PFAS during the Phase 1 of the project, and this laboratory is certified by the Department of Defense (DoD) and the Department of Energy (DOE) to perform PFAS analysis of soil and water samples. Sample containers with appropriate preservatives were provided by HEAL. Upon collection, all samples were placed on ice in dedicated sample coolers and shipped to HEAL under appropriate chain of custody. HEAL forwarded the containers to Enthalpy for PFAS analysis.

DBS&A sampled three wells downgradient (east and southeast) of Cannon AFB in April 2023. These included two domestic wells and downgradient monitor well DBS-1, which was installed during Phase 1. Enthalpy analyzed the groundwater samples for 29 PFAS compounds using EPA methods 533 and 537.1.

Field parameter measurements for the samples from these three locations are provided in Table 4. The laboratory results for PFAS analysis of the samples from these three locations are provided in Table 5. The laboratory report for groundwater samples analyzed by Enthalpy are provided in Appendix A. EPA methods 533 and 537.1 are validated and approved by EPA for analysis of PFAS in drinking water, and have different, but overlapping, target analyte lists. For analytes analyzed by both methods, the lowest result was reported in Table 5 for non-detects and the highest result was reported for detections.

PFAS were detected in one sample (COS-36). PFOA and PFOS were not detected in this sample, but the sample contained a total PFAS concentration of 80.02 ng/L. The sample contained four PFCAs (PFBA, PFPeA, PFHxA, and PFHpA) and three PFSAs (PFBS, PFPeS, and PFHxS). PFCAs comprise approximately 70 percent of total PFAS detected, dominated by PFPeA (22.8 ng/L) and PFHxA (22 ng/L). The dominant PFSA was PFHxS (13.4 ng/L).

On June 15, 2022, EPA issued updated lifetime drinking water HAs for PFOA (0.004 ng/L), PFOS (0.02 ng/L), PFBS (2,000 ng/L), and HFPO-DA (10 ng/L). None of the PFAS concentrations detected in the COS-36 sample exceed those standards. However, exceedances for PFOA and PFOS cannot be ruled out because the reporting limits for PFOA and PFOS (1.91 to 1.94 ng/L, respectively, in the COS-36 sample) currently achievable by accredited laboratories are well above these standards.

On March 14, 2023, EPA announced non-enforceable proposed maximum contaminant levels for PFOA and PFOS of 4 ng/L, and proposed MCLGs of zero. At that time, EPA also announced a proposed MCL and MCLG for mixtures containing the following: PFNA, PFHxS, PFBS, and HFPO-DA (U.S. EPA, 2023). The April 2023 COS-36 sample exceeds the proposed MCL for mixtures based on the detected concentration of PFHxS.

Well COS-36 (or a well at or near the same location) was sampled by the USAF on September 25, 2018 (AFW, 2019). That September 2018 sample, designated CANON-RES1495-01-SP, was analyzed for PFAS; none were detected at a reporting limit of 4.2 ng/L. The USAF results are presented in Table 13 of the Phase 1 report (DBS&A, 2022).

During the Phase 1 investigation, DBS&A installed monitor well DBS-1 approximately 5.4 miles east-southeast of the southeast corner of Cannon AFB (Figure 3), from which one of the PFAS plumes emanate. The laboratory reported that the initial sample collected from DBS-1 in February 2022 contained PFBA at an estimated concentration (below the reporting limit and qualified) of 2.18 ng/L. DBS&A resampled DBS-1 in April 2023, and no PFAS were detected in the primary or duplicate samples (Table 5). A second sample was collected from DBS-1 in June 2023, but the results were not available at the time this report was prepared. Those results will be discussed in the Phase 3 report.

A total of 14 PFAS were detected in one or more of the groundwater samples from the Cannon off-site (COS) wells collected during Phase 1 by DBS&A. Of the 14 PFAS detected, 6 were PFCAs 5 were PFSAs, and 3 were FTSs. The PFAS data were analyzed by examining the proportions (percent) of individual PFAS detected in each sample.

- PFAS were detected in approximately 70 percent of the COS wells sampled during Phase 1. Total PFAS detected in the Phase 1 COS wells ranged from 1.8 ng/L to 37,732.87 ng/L.
- The proportions of PFCAs exceeded the proportions of PFSAs in about 40 percent of the wells in which PFAS were detected. Most of the wells along the east side of Cannon AFB are dominated by PFCAs, and on average contain 62 percent PFCAs, 34 percent PFSAs, and

4 percent FTSs. The April 2023 COS-36 sample falls within this category, but contains no FTSs.

- The proportions of PFSAs exceeded the proportions of PFCAs in 60 percent of the wells in which PFAS were detected. Most of the wells within the plume emanating from the southeast corner of the CAFB are dominated by PFSAs, and on average contain 60 percent PFSAs, 34 percent PFCAs, and 6 percent FTSs.

In June 2023, DBS&A resampled monitor well DBS-1 and the two domestic wells that were sampled in April 2023, and also sampled seven other domestic wells. The June 2023 groundwater samples will be analyzed for 40 PFAS compounds using isotope dilution liquid chromatography/tandem mass spectrometry (LC/MS/MS) methods. This is the method that was used during Phase 1, and that was used for DoD compliant projects (adhering to Table B-24 of the DOD's Quality Systems Manual). The number of PFAS compounds being analyzed is larger than the list of compounds analyzed during Phase 1 and during other DoD sampling events discussed in the Phase 1 report. The number of PFAS compounds has been increased from 29 to 40 to be consistent with the compounds that are analyzed by EPA's draft method 1633. The DoD has begun using draft method 1633 for PFAS analyses, but a number of states have not (Christmann, 2023). Draft method 1633 is expected to be finalized by the end of 2023. The June 2023 groundwater quality results had not been received at the time this report was prepared.

9.3 Numerical Modeling

To evaluate PFOS and PFOA transport, an existing regional groundwater model that covers a large area including Cannon AFB was used as a starting point. Although existing regional models that include the region of interest are too coarse for detailed plume simulation, they can provide useful information on aquifer hydraulic properties, regional groundwater stresses, and changes in groundwater flow directions over time. The results of the regional model were used to obtain the hydraulic head values at the boundaries of a smaller, local groundwater model developed for the vicinity of Cannon AFB. The approach of developing an embedded local model based on a larger-scale regional model is particularly important for the Ogallala Aquifer because the PFOS and PFOA plumes have developed over time while aquifer conditions have been changing. In this type of situation, it is advantageous to use a regional model to define transient boundary conditions at the edge of a more detailed groundwater flow and solute transport model.

This section describes the regional and local models developed for PFOS and PFOA plume evaluation, and presents the results of initial PFOS and PFOA transport simulations. There are three models discussed: the regional groundwater model, the local groundwater model, and the local contaminant transport model.

9.3.1 Regional Groundwater Flow Model

DBS&A developed two regional groundwater flow models (Blandford et al., 2003 and 2008) for the Texas Water Development Board (TWDB) that cover the Ogallala Aquifer in Texas and eastern New Mexico. The models were developed as part of the Texas initiative to develop groundwater availability models (GAMs) for the major and minor aquifers in Texas. As part of these models, lithologic data from well logs was used in conjunction with specific capacity data to estimate Ogallala Aquifer hydraulic conductivity. The two models developed by DBS&A were the basis of a subsequent GAM that extended the simulation period and added the underlying Dockum Aquifer to the model (Deeds and Jigmond, 2015). The Ogallala Aquifer portion of that model was, for the most part, unchanged from previous GAMs. The Deeds and Jigmond (2015) model is a three-dimensional groundwater flow model that simulates historical water levels between 1930 and 2012. The model covers an area of 466 miles by 290 miles, and the model grid is divided into 932 rows and 580 columns; each grid cell is 0.5 mile by 0.5 mile. The extent of the model is shown in Figure 4. The model has four layers, in which Layer 1 represents the Ogallala Aquifer. Layer 2 is a dummy layer in the vicinity of Cannon AFB; it provides connectivity between the Ogallala (Layer 1) and the Upper and Lower Dockum (Layers 3 and 4 of the model, respectively).

Another regional model (Musharrfieh and Logan, 1999) was developed by the New Mexico Office of the State Engineer (OSE). This is a two-dimensional groundwater flow model (one model layer representing the Ogallala Aquifer) that simulates aquifer conditions between 1909 and 1990. The model grid has 74 rows and 58 columns; each grid cell is 1 mile by 1 mile. The extent of this model is also shown in Figure 4.

9.3.1.1 Evaluation of Regional Models

DBS&A evaluated both the OSE regional model and the most recent TWDB Ogallala Aquifer GAM to determine the best model for use as a starting point to develop a local model around Cannon AFB. Figure 5 shows a comparison of simulated horizontal hydraulic conductivity in the OSE model and in Layer 1 of the TWDB GAM (both representing the Ogallala Aquifer) in the vicinity of Cannon AFB. The figure shows a more detailed distribution of hydraulic conductivity in the TWDB GAM than in the OSE model. More importantly, a high hydraulic conductivity value

is simulated in the TWDB GAM along the paleochannel that runs across Cannon AFB (Figure 5). This paleochannel was depicted in Appendix B of the Cannon AFB Phase 1 investigation report (DBS&A, 2022) by mapping the base elevation of the Ogallala Formation. A paleochannel in the same general area was simulated in the Blandford et al. (2003) model (Figure 5). As detailed in Blandford et al. (2003), paleochannels in the Ogallala Aquifer tend to have higher aquifer hydraulic conductivity relative to adjacent, non-paleochannel regions. This observation is incorporated in the hydraulic conductivity distribution of the TWDB GAM (Figure 5).

Based on review of the two models, the determination was made to use the TWDB GAM as a starting point to develop the local model around Cannon AFB. This determination was made primarily because:

- The TWDB GAM has a more detailed hydraulic conductivity distribution that follows the lithologic understanding of higher hydraulic conductivity within paleochannels, including in the area of Cannon AFB.
- The TWDB GAM simulates conditions through more recent time (2012 vs. 1990 in OSE model)

The TWDB GAM of Deeds and Jigmond (2015) is hereafter referred to as the regional model.

9.3.1.2 Calibration Evaluation of the Regional Model

The calibration of the regional model in the vicinity of Cannon AFB was evaluated by plotting measured and simulated water levels at 55 monitor wells in the vicinity of Cannon AFB. These wells are listed in Table 6. Well locations are shown in Figure 6. For the wells inside Cannon AFB, measured water level data were obtained from Cannon AFB. For wells outside Cannon AFB, water levels were obtained from the USGS National Water Information System (NWIS).

Appendix B shows measured and simulated water levels at the 55 wells. The comparison shows that the model reasonably simulates the observed trend in water levels at most wells. There are several wells where the model overestimates or underestimates the observed water levels. One quantitative measure of the goodness of fit of a groundwater model is the root mean squared error (RMSE), which is a statistical measure of the difference between measured and simulated water levels. RMSE of the regional model in the vicinity of Cannon AFB is 32.8 feet, which represents 12.6 percent of the difference between highest measured water level and lowest measured water level in all 55 wells. One common rule of thumb to determine an acceptable model calibration is to have a RMSE of 10 percent or less of the range in observed water levels,

a measure unmet by the regional model in the vicinity of Cannon AFB. Therefore, it was decided to update the regional model calibration in the vicinity of Cannon AFB to better match observed water levels. Rather than conduct the updated calibration using the full regional model, a local groundwater model was developed around Cannon AFB, and adjustments were made to the local model.

9.3.2 Local Groundwater Flow Model

The local groundwater flow model developed around Cannon AFB covers an area of 24 miles by 26 miles with a model grid divided into 384 rows and 416 columns (Figure 7). Each grid cell is 330 feet by 330 feet. The local model has only one layer, and the top and bottom elevations of the layer are imported from Layer 1 of the regional model. Each regional model grid cell is represented by 64 local model grid cells (Figure 7). To ensure smoothness of the top and bottom elevation surfaces in the local model, elevations of the regional model (the coarse grid) were linearly interpolated to obtain values at each local model grid cell.

The local groundwater model simulates conditions from 1930 through 2022; the USGS MODFLOW-NWT (Niswonger et al., 2011) platform was used for model development. One feature of MODFLOW-NWT different from previous versions of MODFLOW is that the user can specify a minimum layer thickness fraction at which the pumping from a model cell is automatically scaled back. This capability allows for the simulation of the decline in pumping rate that has occurred at Ogallala Aquifer wells due to the reduction in saturated thickness. A minor modification was made to the source code to change the way the minimum thickness fraction is specified. In the original code, the minimum thickness is specified as a fraction of the cell thickness. The modification allows the user to enter a minimum saturated thickness value (in feet) at which pumping will be curtailed. In the local groundwater model, the minimum thickness at which pumping would be curtailed was set to 30 feet, consistent with the regional model.

9.3.2.1 Local Model Boundary Conditions

Groundwater stresses, such as pumping and recharge, were obtained from the reginal model for the period 1930 through 2012. Stresses from 2013 through 2022 were held constant at 2012 values. Because the model automatically curtailed the pumping from a model cell when the saturated thickness reached 30 feet in that cell, simulated pumping from many of the wells in the period 2013 through 2022 were lower than the 2012 values.

The local model is surrounded by specified head boundaries on all four sides (Figure 7), with time-series specified head values obtained from the simulated heads of the regional model at those locations. Because the regional model has coarser grid cells than the local model, simulated heads at the regional model grid cells at those edges were linearly interpolated and applied to the finer grid cells of the local model.

Any pumping well in a regional model grid cell within the local model extent (except for wells within Cannon AFB) was applied to one local model cell in the middle of the 64 local model grid cells that represent the regional model grid cell (Figure 6). All simulated pumping in the regional model within Cannon AFB was removed and replaced by currently active wells of the Cannon AFB public water system. As explained in Bristol (2021), Well #4A mainly supplies irrigation water for the golf course, while Wells #5, #8, #9, and #12 currently supply drinking water (Figure 7). Simulated pumping values in the local model are 125, 100, 112.5, 150, and 175 gallons per minute (gpm) for wells 4A, 5, 8, 9, and 12, respectively. These values represent 50 percent of the average pumping rates listed in Bristol (2021). Total simulated pumping from wells in Cannon AFB is approximately 955,000 gallons per day (gpd), which is similar to the 1,000,000 gpd value listed in Bristol (2021).

For all boundary conditions other than pumping and specified hydraulic head at the local model boundary, the simulated value in a regional model grid cell was applied to all equivalent 64 local model grid cells.

9.3.2.2 Local Model Calibration

Aquifer hydraulic properties (e.g., hydraulic conductivity and storage coefficient) were initially taken from the regional model, but were modified during model calibration. Initially, the hydraulic property from a regional model grid cell was applied to all 64 local models grid cells included in the regional model grid cell. This approach led to simulated results from the local model similar to those of the regional model.

The local groundwater flow model calibration was consisted of minimizing the differences (the RMSE) between simulated and observed water levels at 55 monitor wells. Because the specified head boundaries at the edges of the local model were obtained from the regional model, it was necessary to keep the changes to hydraulic properties in the local model at distance from the local model boundaries to minimize effects on the simulated hydraulic heads results at the edges of the local model. Figure 8 shows the area of the local model within which hydraulic conductivity was allowed to change from the values of regional model; this area is 4 miles from the edges of the local model.

Within the zone where the hydraulic conductivity was allowed to change, the pilot point approach was used to populate a hydraulic conductivity value in each local model cell. Each pilot point is a parameter that can have a unique value of hydraulic conductivity. The set of pilot points is then interpolated to the model grid to create a heterogeneous distribution. Automated parameter estimation program (PEST) (Doherty, 2010) was used to obtain a unique value in each pilot point, such that when the hydraulic conductivity values of all pilot points are interpolated, they result in a hydraulic conductivity distribution that minimizes the RMSE between measured and simulated heads in the monitor wells.

A total of 106 pilot points were used in the model (Figure 8). Of those points, 90 are placed in the model in a uniform grid pattern. Another 16 pilot points were added, mostly along the inferred paleochannel (Figure 8). Of those pilot points, 6 (at the edge of the zone where hydraulic conductivity was allowed to change) had fixed values to ensure a smooth transition between hydraulic conductivity outside that zone and resulting hydraulic conductivity inside that zone. Thus, PEST was allowed to change the hydraulic conductivity at 100 pilot points within a given range prescribed for each point.

Most of the pilot points (64) were assigned a range of allowable hydraulic conductivity of 5 to 75 feet per day (ft/d). This range is consistent with Howard (1954), who estimated hydraulic conductivity ranging from 8 to 92 ft/d in the area east of Clovis. This range is also consistent with the estimated hydraulic conductivities from the Cannon AFB production well and two nearby irrigation wells, which ranged from 20 to 60 ft/d (Trinity, 2012). A total of 21 pilot points, mostly along the inferred paleochannel, had an allowable hydraulic conductivity range of 50 to 200 ft/d, which is the highest end of the range of Hart and McAda (1985) for the High Plains Aquifer in Curry County. The remaining 21 pilot points provide a transition between pilot points with a low hydraulic conductivity range and those with a high hydraulic conductivity range. The range of hydraulic conductivity values for those 21 pilot points is 25 to 125 ft/d.

PEST was run and the optimization algorithm required over 1,000 local groundwater model simulations. Details of the optimization algorithm can be found in (Doherty, 2010). The optimum hydraulic conductivity determined for each pilot point and the resulting hydraulic conductivity of the local model are shown in Figure 9. Appendix B shows improved calibration of the local model in almost all calibration wells compared to the regional model. The RMSE of the local model is 12.1 feet, which is 4.6 percent of the range of the measured water level data, well below the 10 percent threshold. Figure 10 shows simulated heads as of 2022, which shows southeasterly flow direction consistent with DBS&A (2022).

9.3.3 Transport Model

A second local model that covers an even smaller region than the local groundwater model was developed to conduct solute transport simulations. This model is referred to as the transport model. This transport model covers a subregion of the local groundwater flow model, and boundary conditions are determined based on the local groundwater flow model using the same approach as described for the regional and local groundwater models.

The transport model has dimensions of 10 miles by 12 miles (Figure 11), and the model grid is discretized into cells of 110 feet by 110 feet. Hydraulic properties and boundary conditions for the transport model were imported from the local groundwater flow model without modification. As a result of importing the hydraulic properties from the local groundwater flow model "as is," and imposing boundaries at the edges of the transport model using the results of the local groundwater flow model, the simulated heads in the transport model are nearly identical to those of the local groundwater flow model (Figure 11).

A preliminary PFOS and PFOA fate and transport simulation was conducted to simulate plume migration downgradient of Cannon AFB. Additional transport simulations will be conducted in the future as part of a separate scope of work. The contaminant transport modeling was conducted using with MT3D-USGS (Bedekar et al., 2016). The contaminant transport simulation assumed constant concentrations of PFOS and PFOA at seven model cells at the southeast corner of Cannon AFB, consistent with the locations of highest measured concentrations as of December 2021 (Figure 12). The constant concentration at the cell at the right was assigned measured concentration of well MW-Ca as of December 2021. The constant concentration at the cell at the left was assigned the observed concentration of well MW-D as of December 2021. The concentration was linearly interpolated between those two cells to estimate concentration values at the five model cells between those two bounding cells. For all seven cells, the prescribed concentration was held constant from 1970 through 2022, a period of 53 years.

Values of contaminant transport parameters (e.g., dispersivity, effective porosity, and retardation factor) used in the simulations for both PFOS and PFOA are listed in Table 7. Although these values are reasonable estimates, they may be adjusted when additional solute transport simulations are conducted.

Simulated concentrations for PFOS and PFOA as of 2022 are depicted in Figures 13 and 14, respectively. The model shows that the PFOS plume is approximately 1.6 miles long (Figure 13). The simulated PFOA plume, which is subject to a lower assigned retardation factor, is approximately 3 miles long (Figure 14).

10.2 Status

Bristol began drilling in April 2022, and by the end of July 2022 had completed 7 of 13 permitted monitor wells on Cannon AFB. It is likely that they would have completed all of the wells by the end of 2022, but the OSE database only has data for 7 wells. These logs, a figure showing the monitor well locations, and a table summarizing their well completion information are provided in Appendix C. No permits from OSE had been identified for any off-site monitor well locations.

DBS&A contacted the USAF in May 2023 to request an update on the status of the RI at Cannon AFB. The U.S. Air Force Civil Engineer Center restoration project manager at Cannon AFB said that 9 of 13 proposed on-base monitor wells have been completed, and that 15 off-base monitor wells are proposed and will be installed after the USAF negotiates access for the proposed locations (Gierke, 2023).

An RI report will be prepared that will include descriptions of field activities and a summary of the scope of work and any deviations, as well as a base-wide conceptual site model addressing hydrogeologic conditions, the nature and extent of contamination, potential sources of PFAS contamination, fate and transport of PFAS, and potential exposure pathways and receptors (Bristol, 2021). The time frame for this report is unknown, but it will likely not be prepared until all RI activities are complete.

11. Recommendations

Recommendations from the Phase 1 report that were not addressed during Phase 2 that DBS&A recommends be the focus of Phase 3 of the project include the following:

- Establish a technical dialogue between NMED, USAF, and EPA to determine the nature and extent of the USAF's plans for off-site investigation and to coordinate field and data collection efforts.
- Obtain monthly or quarterly progress reports on activities associated with the USAF RI from the USAF or EPA, including access to preliminary data. The USAF RI report documenting the results of the investigation will not be available for some time. Therefore, NMED should coordinate with USAF to obtain characterization data for PFAS-contaminated sediment in the vadose zone and groundwater sample splits from new and existing monitor wells.

- Conduct analytical and/or numerical modeling activities to assess groundwater flow and PFAS transport and to better define the nature and extent of PFAS contamination at the Cannon site.

Coordination with the USAF regarding their ongoing RI and the potential for splitting samples for their proposed off-base monitor wells is seen as the highest priority action for the Cannon site in FY 2024. The initial Cannon site groundwater modeling was performed during Phase 2 (Section 9.3). DBS&A proposes to discuss the Phase 2 Cannon site modeling and results with NMED before outlining potential future modeling activities.

References

Air Force Civil Engineer Center (AFCEC). 2018. Swap complete: AF protects airmen, environment with new firefighting foam. Published June 21, 2018. <https://www.afcec.af.mil/News/Article-Display/Article/1556282/swap-complete-af-protects-airmen-environment-with-new-firefighting-foam>.

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AFW. 2019. *Final Addendum 01 to the final site inspection report, Site inspection of aqueous film forming foam (AFFF) release areas, Environmental Programs Worldwide, Cannon Air Force Base, Clovis, New Mexico*. Prepared for Air Force Civil Engineer Center, Joint Base San Antonio - Lackland, Texas. March 2019.

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S:\Projects\DB23.1087_NMED_PFAS_FY2023\VR_Drawings\Illustrator\F02 Cannon AFFF Release Areas.ai

DBS&A a Geo-Logic Company

6/15/2023 DB23.1087

NMED PFAS INVESTIGATION, CANNON AFB

AFFF Release Areas

Figure 2

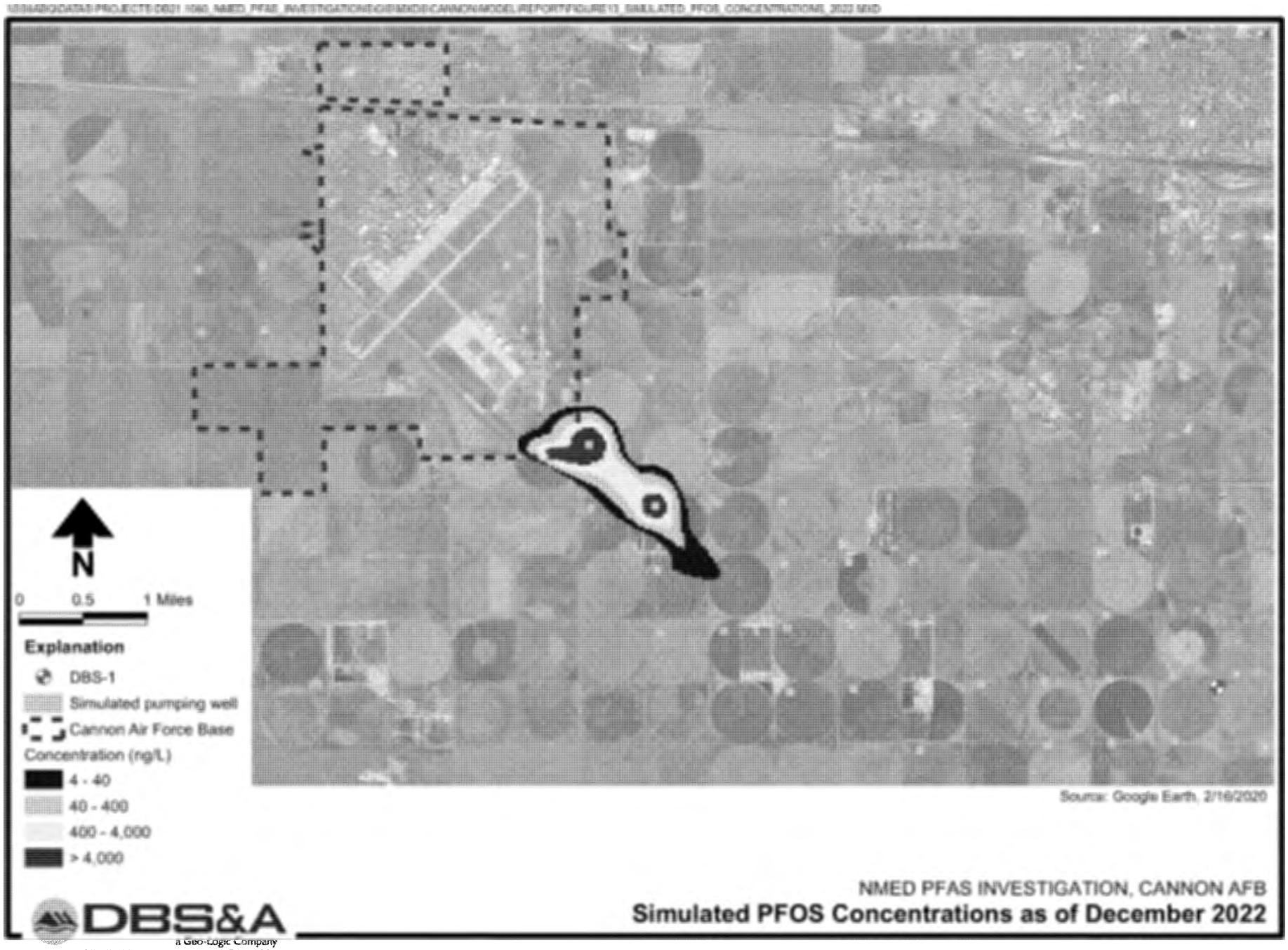

N
0 0.5 1 Miles
Explanation
DBS-1
Simulated pumping well
Cannon Air Force Base
Concentration (ng/L)
4 - 40
40 - 400
400 - 4,000
> 4,000
Source: Google Earth, 2/16/2020
DBS&A
a Geo-Logic Company
6/30/2023
DB23.1087
NMED PFAS INVESTIGATION, CANNON AFB
Simulated PFOS Concentrations as of December 2022

Figure 13

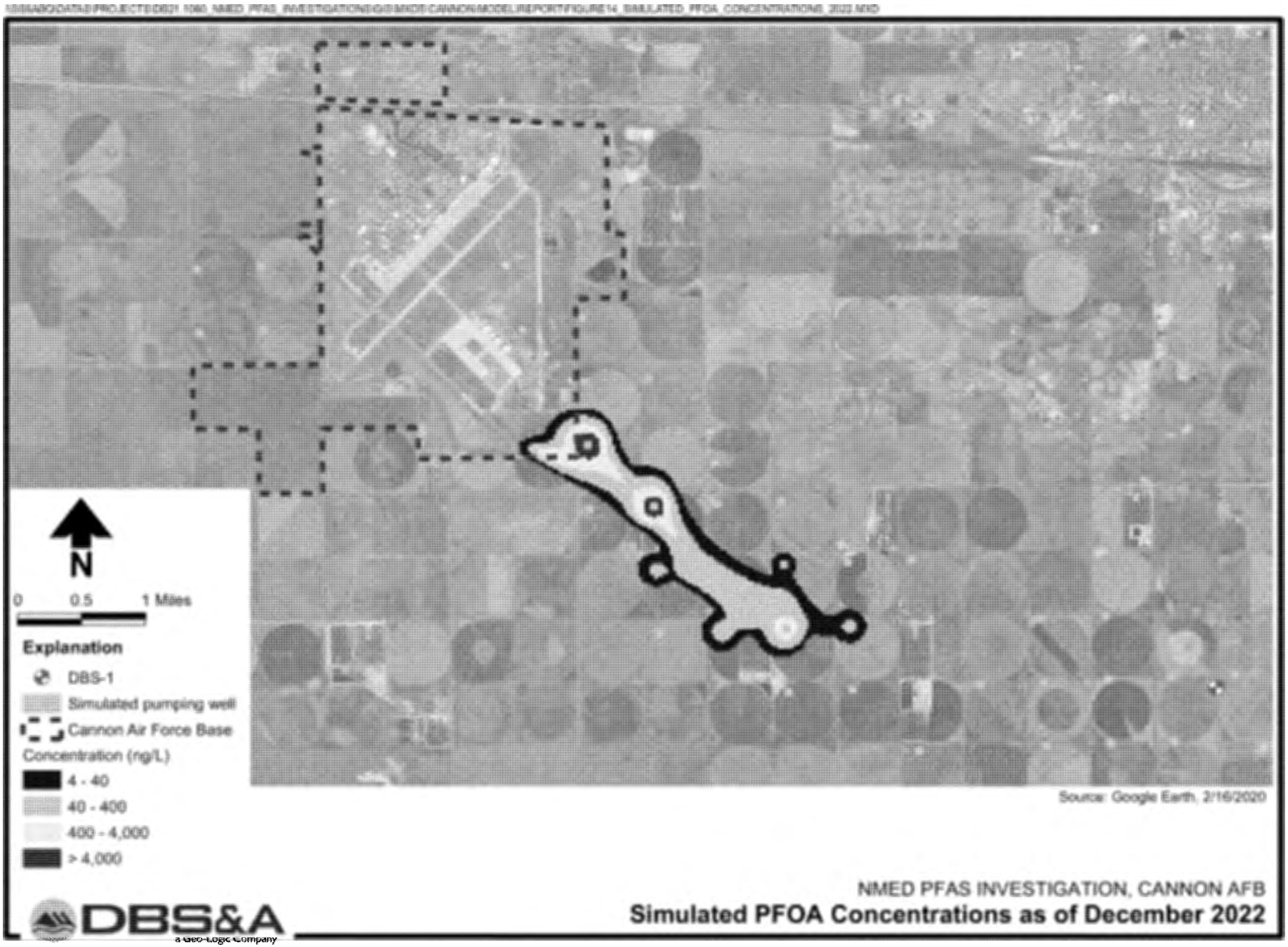

N
0 0.5 1 Miles
Explanation
DBS-1
Simulated pumping well
Cannon Air Force Base
Concentration (ng/L)
4 - 40
40 - 400
400 - 4,000
> 4,000
Source: Google Earth, 2/16/2020
DBS&A
a Geo-Logic Company
6/30/2023
DB23.1087
NMED PFAS INVESTIGATION, CANNON AFB
Simulated PFOA Concentrations as of December 2022

Figure 14

Exhibit 8

OK to PAY, Patrick Longmire March 24, 2021

Daniel B. Stephens & Associates, Inc.

Chris Catechis Digitally signed by Chris Catechis Date: 2021.03.24 10:55:13 -06'00'

Phase I Remedial Investigation in the Vicinity of Cannon Air Force Base, Curry County, and Holloman Air Force Base, Otero County, New Mexico

Work Order #: DBSA-PFAS

NMED Subaccount Code: GWB1001

NMED Activity Code: 003050814

Contract #: 21-667-1210-0002

Summary of Tasks Performed and Deliverables Produced Between February 9 and 28, 2021

Phase 1, Cannon AFB

- Task 1, Data review and site visit
  - Kick-off meeting, file transfer, reviewing files and reports, compiling information and mapping the base of the Ogallala aquifer, project calls with Pat Longmire, identified offsite wells to be sampled, and creating figures.
- Task 2, Planning documents
  - Begin sampling and analysis plan
- Task 7, Modeling
  - Correspondence, task management and coordination with Michael Anderson (limnologist)

Phase 2, Holloman AFB

- Task 1, Data review and site visit
  - Project management, kick-off meeting, file transfer, reviewing files and reports, compiling private well information, project calls with Pat Longmire, and creating figures.
- Task 2, Planning documents
  - Begin sampling and analysis plan
- Task 8, Waterfowl & small mammal survey
  - Coordination with the University of New Mexico Museum of Southwestern Biology

Phase 1, Cannon Air Force Base Budget and Costs, February 28, 2021

Task	Description	Budget [a]	Spent	Remaining
1	Site data review and site visit	$12,528.00	$6,678.10	$5,849.90
2	Planning documents	$18,310.00	$425.00	$17,885.00
3	Sampling existing water supply wells	$14,231.00	---	$14,231.00
4	Drilling and well installation	$266,944.62	$29.40	$266,915.22
5	One year of quarterly GW monitoring	$62,260.00	---	$62,260.00
6	Phase 1 progress report	$19,950.00	---	$19,950.00
7	Modeling	$9,051.25	$378.00	$8,673.25
	Subtotal	$403,274.87	$7,510.50	$395,764.37
New Mexico Gross Receipts Tax (7.875%)		$31,757.90	$591.45	$31,166.44
	Total	**$435,032.77**	**$8,101.95**	**$426,930.81**

[a] Budget values as reflected on the NMED Notice to Proceed, dated February 9, 2021

Phase 2, Holloman Air Force Base Budget and Costs, February 28, 2021

Task	Description	Budget [a]	Spent	Remaining
1	Site data review and site visit	$12,470.00	$6,652.65	$5,817.35
2	Planning documents	$18,310.00	$1,408.20	$16,901.80
3	Sampling existing water supply wells	$9,840.00	---	$9,840.00
4	Drilling and well installation	$156,212.00	---	$156,212.00
5	One year of quarterly GW monitoring	$38,852.00	---	$38,852.00
6	Phase 1 progress report	$19,950.00	---	$19,950.00
7	Modeling	$9,051.25	---	$9,051.25
8	Waterfowl and small mammal survey	$185,800.00	$303.60	$185,426.40
	Subtotal	$450,485.25	$8,364.45	$442,120.80
New Mexico Gross Receipts Tax (7.875%)		$35,475.72	$658.70	$34,817.01
	Total	**$485,960.97**	**$9,023.15**	**$476,937.81**

[a] Budget values as reflected on the NMED Notice to Proceed, dated February 9, 2021

DBS&A
Daniel B. Stephens & Associates, Inc.

Daniel B. Stephens & Associates, Inc.
2777 E. Guasti Road, Suite 1
Ontario, California 91761
(505) 822-9400

March 16, 2021
Project No: DB21.1060.00
Invoice No: 0247161

Current Invoice Total **$17,125.10**

Michelle Hunter
New Mexico Environment Department
1190 St. Francis Drive
Santa Fe, NM 87502

Project DB21.1060.00 NMED Cannon and Holloman AFB PFAS Investigations
NMED Contract 21-667-1210-00002-00

Professional Services from February 1, 2021 to February 28, 2021

Phase 0000001 Cannon AFB

Task 0001 Data review and site visit

Professional Personnel

	Hours	Rate	Amount
PROJECT PROFESSIONAL I	.10	138.00	13.80
PROJECT PROFESSIONAL II	23.90	148.00	3,537.20
PROJECT PROFESSIONAL III	17.40	157.00	2,731.80
CADD/GIS/DATABASE II	2.50	115.00	287.50
PROJECT ASSISTANT II	1.10	98.00	107.80
Totals	45.00		6,678.10
Total Labor			**6,678.10**

Total this Task **$6,678.10**

Task 0002 Planning documents

Professional Personnel

	Hours	Rate	Amount
PROJECT PROFESSIONAL II	.75	148.00	111.00
PROJECT PROFESSIONAL III	2.00	157.00	314.00
Totals	2.75		425.00
Total Labor			**425.00**

Total this Task **$425.00**

Task 0004 Drilling and well installation

Professional Personnel

	Hours	Rate	Amount
PROJECT ASSISTANT II	.30	98.00	29.40
Totals	.30		29.40
Total Labor			**29.40**

Total this Task **$29.40**

Task 0007 Modeling

Project DB21.1060.00 NMED Cannon and Holloman AFB PFAS Invest Invoice 0247161

Professional Personnel

	Hours	Rate	Amount	
SENIOR PROFESSIONAL I	2.25	168.00	378.00	
Totals	2.25		378.00	
Total Labor				**378.00**
			Total this Task	**$378.00**
			Total this Phase	**$7,510.50**

Phase 0000002 Holloman AFB

Task 0001 Data review and site visit

Professional Personnel

	Hours	Rate	Amount	
PROJECT PROFESSIONAL II	8.30	148.00	1,228.40	
PROJECT PROFESSIONAL III	23.25	157.00	3,650.25	
CADD/GIS/DATABASE II	15.00	115.00	1,725.00	
PROJECT ASSISTANT II	.50	98.00	49.00	
Totals	47.05		6,652.65	
Total Labor				**6,652.65**
			Total this Task	**$6,652.65**

Task 0002 Planning documents

Professional Personnel

	Hours	Rate	Amount	
PROJECT PROFESSIONAL II	9.25	148.00	1,369.00	
PROJECT ASSISTANT II	.40	98.00	39.20	
Totals	9.65		1,408.20	
Total Labor				**1,408.20**
			Total this Task	**$1,408.20**

Task 0008 Waterfowl & small mammal survey

Professional Personnel

	Hours	Rate	Amount	
PROJECT PROFESSIONAL I	2.20	138.00	303.60	
Totals	2.20		303.60	
Total Labor				**303.60**
			Total this Task	**$303.60**
			Total this Phase	**$8,364.45**

Taxes

ABQ Gross Receipts Tax	7.875 % of 15,874.95	1,250.15	
Total Taxes		**1,250.15**	**1,250.15**
		Current Invoice Total	**$17,125.10**

Billings to Date

	Current	Prior	Total
Labor	15,874.95	0.00	15,874.95
Tax	1,250.15	0.00	1,250.15
Totals	**17,125.10**	**0.00**	**17,125.10**

Project	DB21.1060.00	NMED Cannon and Holloman AFB PFAS Invest	Invoice	0247161

Project DB21.1060.00 NMED Cannon and Holloman AFB PFAS Invest Invoice 0247161

Billing Backup

Tuesday, March 16, 2021

GEOLOGIC ASSOCIATES, INC. Invoice 0247161 Dated 3/16/2021 8:01:33 AM

Project DB21.1060.00 NMED Cannon and Holloman AFB PFAS Investigations

Phase 0000001 Cannon AFB

Task 0001 Data review and site visit

Professional Personnel

			Hours	Rate	Amount
PROJECT PROFESSIONAL I					
00049	30000049OF - 0 - Griggs, Donald	2/3/2021	.10	138.00	13.80
	Project directory creation (AEwi)				
PROJECT PROFESSIONAL II					
00133	33000133OF - 0 - Casadevall, William	2/10/2021	7.80	148.00	1,154.40
	Kickoff meeting & file transfer; compile info to map base of Ogallala				
00133	33000133OF - 0 - Casadevall, William	2/11/2021	2.00	148.00	296.00
	Compile info to map base of Ogallala				
00133	33000133OF - 0 - Casadevall, William	2/15/2021	8.10	148.00	1,198.80
	mapping base of Ogallala aquifer in CAFB area				
00133	33000133OF - 0 - Casadevall, William	2/17/2021	.50	148.00	74.00
	mapping base of Ogallala aquifer in CAFB area				
00133	33000133OF - 0 - Casadevall, William	2/18/2021	1.00	148.00	148.00
	work with GIS to map DoH sample locations				
00133	33000133OF - 0 - Casadevall, William	2/19/2021	2.00	148.00	296.00
	Compile info on PFAS cross contamination				
00133	33000133OF - 0 - Casadevall, William	2/20/2021	2.00	148.00	296.00
	mapping base of Ogallala aquifer in CAFB area				
00133	33000133OF - 0 - Casadevall, William	2/28/2021	.50	148.00	74.00
	Review McQuillan files				
PROJECT PROFESSIONAL III					
00463	35000463OF - 0 - Bunch, John	2/18/2021	1.00	157.00	157.00
	project management, doc review				
00463	35000463OF - 0 - Bunch, John	2/22/2021	1.25	157.00	196.25
	doc prep, proj man				
00463	35000463OF - 0 - Bunch, John	2/24/2021	1.00	157.00	157.00
	proj man				
00463	35000463OF - 0 - Bunch, John	2/26/2021	1.50	157.00	235.50
	doc prep, proj man				
00412	35000412OF - 0 - Ewing, Amy	2/2/2021	.75	157.00	117.75
	project folder set up; references and project docs				
00412	35000412OF - 0 - Ewing, Amy	2/8/2021	1.25	157.00	196.25
	spoke to Pat Longmire re: revising project budget; prep for kick-off meeting				

Project	DB21.1060.00	NMED Cannon and Holloman AFB PFAS Invest	Invoice	0247161	
00412	35000412OF - 0 - Ewing, Amy	2/9/2021	.75	157.00	117.75
	spoke to Pat and John re: notice to proceed				
00412	35000412OF - 0 - Ewing, Amy	2/10/2021	.25	157.00	39.25
	coordination with Bill C. re: ENMRWS				
00412	35000412OF - 0 - Ewing, Amy	2/11/2021	2.50	157.00	392.50
	review of existing Cannon reports & coordination with Bill C.; coordination with Clovis & Pat re: AFCEE public meeting planned in March				
00412	35000412OF - 0 - Ewing, Amy	2/15/2021	2.25	157.00	353.25
	review of Cannon AFB PFAS progress, AFB's Remedial Investigation project plans				
00412	35000412OF - 0 - Ewing, Amy	2/16/2021	.75	157.00	117.75
	sent base commander info to Pat				
00412	35000412OF - 0 - Ewing, Amy	2/23/2021	1.50	157.00	235.50
	PFAS call with John B. and Pat				
00412	35000412OF - 0 - Ewing, Amy	2/25/2021	.75	157.00	117.75
	spoke to Randy Crowder, set next PFAS call, coordination re: dairy well installation reports				
00412	35000412OF - 0 - Ewing, Amy	2/26/2021	1.50	157.00	235.50
	PFAS call with John B., Bill, and Pat				
00067	35000067OF - 0 - Thurgood, Michael	2/11/2021	.40	157.00	62.80
	Preparing document index database.				
	CADD/GIS/DATABASE II				
01066	46001066OF - 0 - Romero, Samuel	2/12/2021	1.00	115.00	115.00
	Plotted well location from table, Found and downloaded elevation data from USGS				
01066	46001066OF - 0 - Romero, Samuel	2/19/2021	1.50	115.00	172.50
	Created points from table, created new figure				
	PROJECT ASSISTANT II				
00140	94100140OF - 0 - Salvato, Deborah	2/12/2021	.50	98.00	49.00
	Document indexing.				
00140	94100140OF - 0 - Salvato, Deborah	2/15/2021	.40	98.00	39.20
	Document indexing.				
00140	94100140OF - 0 - Salvato, Deborah	2/23/2021	.20	98.00	19.60
	Print large format for BCasadevall.				
	Totals		45.00		6,678.10
	Total Labor				**6,678.10**
				Total this Task	**$6,678.10**

Task 0002 Planning documents

Professional Personnel

			Hours	**Rate**	**Amount**
	PROJECT PROFESSIONAL II				
00502	33000502OF - 0 - Raucci, Jason	2/11/2021	.75	148.00	111.00
	project planning				

Project	DB21.1060.00	NMED Cannon and Holloman AFB PFAS Invest	Invoice	0247161	
PROJECT PROFESSIONAL III					
00463	35000463OF - 0 - Bunch, John	2/10/2021	1.00	157.00	157.00
	project management				
00463	35000463OF - 0 - Bunch, John	2/11/2021	1.00	157.00	157.00
	project management				
	Totals		2.75		425.00
	Total Labor				**425.00**
				Total this Task	**$425.00**

Task 0004 Drilling and well installation

Professional Personnel

			Hours	**Rate**	**Amount**	
PROJECT ASSISTANT II						
00140	94100140OF - 0 - Salvato, Deborah	2/24/2021	.30	98.00	29.40	
	Work Order prep for Yellow Jacket per JBunch.					
	Totals		.30		29.40	
	Total Labor					**29.40**
				Total this Task		**$29.40**

Task 0007 Modeling

Professional Personnel

			Hours	**Rate**	**Amount**	
SENIOR PROFESSIONAL I						
00490	17000490OF - 0 - Schnaar, Gregory	2/17/2021	.25	168.00	42.00	
	Correspondence, project review					
00490	17000490OF - 0 - Schnaar, Gregory	2/18/2021	1.00	168.00	168.00	
	Correspondence, project review					
00490	17000490OF - 0 - Schnaar, Gregory	2/22/2021	.50	168.00	84.00	
	Task management/coordination with M. Anderson					
00490	17000490OF - 0 - Schnaar, Gregory	2/25/2021	.50	168.00	84.00	
	Task management/coordination with M. Anderson					
	Totals		2.25		378.00	
	Total Labor					**378.00**
				Total this Task		**$378.00**
				Total this Phase		**$7,510.50**

Phase 0000002 Holloman AFB

Task 0001 Data review and site visit

Professional Personnel

			Hours	**Rate**	**Amount**
PROJECT PROFESSIONAL II					
00133	33000133OF - 0 - Casadevall, William	2/10/2021	.80	148.00	118.40
	Kickoff meeting & file transfer				

Project	DB21.1060.00	NMED Cannon and Holloman AFB PFAS Invest		Invoice	0247161
00133	33000133OF - 0 - Casadevall, William	2/25/2021	3.00	148.00	444.00
	Review McQuillan files				
00133	33000133OF - 0 - Casadevall, William	2/26/2021	2.50	148.00	370.00
	Project Team call; Review McQuillan files				
00502	33000502OF - 0 - Raucci, Jason	2/16/2021	1.00	148.00	148.00
	background data review, set up SAP				
00502	33000502OF - 0 - Raucci, Jason	2/19/2021	1.00	148.00	148.00
	bacground data review, set up SAP				
PROJECT PROFESSIONAL III					
00463	35000463OF - 0 - Bunch, John	2/17/2021	1.50	157.00	235.50
	project management, doc review				
00463	35000463OF - 0 - Bunch, John	2/22/2021	1.50	157.00	235.50
	doc prep, proj man				
00463	35000463OF - 0 - Bunch, John	2/23/2021	3.00	157.00	471.00
	doc prep, proj man				
00463	35000463OF - 0 - Bunch, John	2/25/2021	1.50	157.00	235.50
	doc prep, proj man				
00412	35000412OF - 0 - Ewing, Amy	2/10/2021	1.00	157.00	157.00
	internal project kick-off meeting				
00412	35000412OF - 0 - Ewing, Amy	2/11/2021	1.25	157.00	196.25
	call with John Bunch & Pat Longmire regarding getting info from NMED/NMDOH, splitting tasks				
00412	35000412OF - 0 - Ewing, Amy	2/15/2021	1.50	157.00	235.50
	review of Holloman AFB web site & PFAS progress				
00412	35000412OF - 0 - Ewing, Amy	2/16/2021	.75	157.00	117.75
	sent base commander info to Pat				
00412	35000412OF - 0 - Ewing, Amy	2/17/2021	1.50	157.00	235.50
	review of proposal; coordination with Greg Schnaar				
00412	35000412OF - 0 - Ewing, Amy	2/18/2021	2.75	157.00	431.75
	call with UNM biologists; spoke to Greg Schnaar re: modeling & limnology				
00412	35000412OF - 0 - Ewing, Amy	2/18/2021	2.00	157.00	314.00
	spoke to Greg Schnaar re: modeling; spoke to Pat; coordination re: well installation reports/logs				
00412	35000412OF - 0 - Ewing, Amy	2/22/2021	1.00	157.00	157.00
	spoke to John Bunch; emailed Pat; coordination with UNM MSB				
00412	35000412OF - 0 - Ewing, Amy	2/23/2021	2.00	157.00	314.00
	PFAS call with John B. and Pat; sent info to UNM MSB biologists re: funding source				
00412	35000412OF - 0 - Ewing, Amy	2/24/2021	.75	157.00	117.75
	spoke to Pat re: ftp site file transfer				
00412	35000412OF - 0 - Ewing, Amy	2/24/2021	.75	157.00	117.75
	spoke to Pat re: ftp site file transfer				

Project	DB21.1060.00	NMED Cannon and Holloman AFB PFAS Invest	Invoice	0247161	
00412	35000412OF - 0 - Ewing, Amy	2/25/2021	.50	157.00	78.50
	coordination with John B. & Deb re: ftp file transfer				
	CADD/GIS/DATABASE II				
01066	46001066OF - 0 - Romero, Samuel	2/15/2021	7.50	115.00	862.50
	Converted coordinates from table to points shapefile, extracted values to points, created contours from rasters, digitized administrative boundaries created figures.				
01066	46001066OF - 0 - Romero, Samuel	2/22/2021	7.50	115.00	862.50
	Georeferenced imagery, digitized administrative boundaries				
	PROJECT ASSISTANT II				
00140	94100140OF - 0 - Salvato, Deborah	2/12/2021	.50	98.00	49.00
	Document indexing.				
	Totals		47.05		6,652.65
	Total Labor				**6,652.65**
				Total this Task	**$6,652.65**

Task 0002 Planning documents

Professional Personnel

			Hours	Rate	Amount
	PROJECT PROFESSIONAL II				
00502	33000502OF - 0 - Raucci, Jason	2/9/2021	.50	148.00	74.00
	project planning				
00502	33000502OF - 0 - Raucci, Jason	2/11/2021	.75	148.00	111.00
	project planning				
00502	33000502OF - 0 - Raucci, Jason	2/12/2021	2.00	148.00	296.00
	planning docs				
00502	33000502OF - 0 - Raucci, Jason	2/23/2021	1.50	148.00	222.00
	background data review and SAP				
00502	33000502OF - 0 - Raucci, Jason	2/24/2021	2.50	148.00	370.00
	background data review and SAP				
00502	33000502OF - 0 - Raucci, Jason	2/25/2021	1.00	148.00	148.00
	background data review and SAP				
00502	33000502OF - 0 - Raucci, Jason	2/26/2021	1.00	148.00	148.00
	background data review and SAP				
	PROJECT ASSISTANT II				
00140	94100140OF - 0 - Salvato, Deborah	2/15/2021	.40	98.00	39.20
	Document indexing.				
	Totals		9.65		1,408.20
	Total Labor				**1,408.20**
				Total this Task	**$1,408.20**

Task 0008 Waterfowl & small mammal survey

Project	DB21.1060.00	NMED Cannon and Holloman AFB PFAS Invest	Invoice	0247161

Professional Personnel

			Hours	Rate	Amount	
PROJECT PROFESSIONAL I						
00554	30000554OF - 0 - Cartron, Jean-Luc	2/17/2021	.20	138.00	27.60	
	preparation for conference call with UNM MSB					
00554	30000554OF - 0 - Cartron, Jean-Luc	2/18/2021	2.00	138.00	276.00	
	Conference call with UNM MSB re waterfowl study; budget follow-up communications					
	Totals		2.20		303.60	
	Total Labor					**303.60**

Total this Task	**$303.60**
Total this Phase	**$8,364.45**
Total this Project	**$15,874.95**
Total this Report	**$15,874.95**

State of New Mexico
Purchase Order

PO Number to be on all Invoices and Correspondence

NM Environment Department
NMED-1190 St. Francis Drive Rm. S4051
Santa Fe NM 87502
United States

Dispatched **Dispatch Via Print**

Purchase Order	Date	Revision
66700-0000036525	01-05-2021	
Payment Terms	**Freight Terms**	**Ship Via**
Pay Now	FOB Destination	Best Way
Buyer	**Phone**	**Currency**
JESSICA TAPIA		USD

Supplier: 0000048895
DANIEL B STEPHENS &
ASSOCIATES INC
GEOLOGIC ASSOCIATES INC
2777 E GUASTI ROAD SUITE 1
ONTARIO CA 91761-1256
United States

Ship To: NMED-1190 St. Francis
Drive Rm S4100
Santa Fe NM 87502
United States

Bill To: NMED-1190 St. Francis
Drive Rm S4100
Santa Fe NM 87502
United States

Origin: CRB **Exc\Exc#:** 13-1-99-A

Line-Sch	Item/Description	Quantity	UOM	PO Price	Extended Amt	Due Date
1 - 1	Professional Services contract for litigation on PFAS contamination at Holloman and Cannon Air Force Base	1.00	EA	$921,000.00	$921,000.00	01/05/2021
	66700-06400-ZE5098-535200- - - - -92024-E5098					

Schedule Total $921,000.00

Contract ID: 21 667 1210 0002 Contract Line: 0 Release: 1 Category Line: 0

Item Total $921,000.00

Total PO Amount $921,000.00

Agency Approval - I certify that the proposed purchase represented by this document is authorized by and is made in accordance with all State (and if applicable Federal) legislation rules and regulation. I further certify that adequate unencumbered cash and budget expenditure authority exists for this proposed purchase and all other outstanding purchase commitments and accounts payable.

Authorized Signature

ORACLE Enterprise Payables

Invoice

Run Date: 2024-09-03
Run Time: 14:56:54

Business Unit: 66700
Voucher Number: 00133885
Voucher Style: REG
Supplier: 0000048895
Supplier Location: 001
DANIEL B STEPHENS & ASSOCIATES INC
DANIEL B S-001
2777 E GUASTI ROAD SUITE 1

ONTARIO, CA 91761-0000
Payment Terms: NOW
Control Group:
Related Voucher Number:
Lease Number:

Invoice Number: 0247161
Invoice Date: 2021-03-16
Miscellaneous: 0
Freight: 0
VAT: 0

Currency: USD
Use Tax: 0
VAT Not on Invoice: 0

Invoice Total: 17125.1

Voucher Line Information

Line	Item	Description	Quantity	Unit Price	Unit Of Measure	Amount	Distribution Information
1		Professional Services contract	1	17125.1	EA	17125.1	

Distrib #	Account	Amount
1	535200	17125.1

Exhibit 9

PFAS sampling in Curry and Roosevelt Counties

Interim Report, October 2021

Background

During the 2020 Legislative Session, the New Mexico Environment Department (NMED) was appropriated $100,000 "for a well testing program for signs of contaminated drinking and agricultural water resources in Curry and Roosevelt counties." With this funding, NMED developed and implemented a per- and polyfluoroalkyl substances (PFAS) sampling program in the designated counties. This sampling program was conducted by the NMED Drinking Water Bureau in partnership with the U.S. Geological Survey (USGS). Additionally, NMED entered into a Memorandum of Understanding with Clean Water Partnership-Cannon (CWPC) to develop a formal working partnership between CWPC and NMED to help implement the PFAS well sampling program in Curry and Roosevelt Counties.

Participant recruitment

In April 2021, NMED created an information flyer to recruit potential private well owners for free PFAS well sampling in Curry and Roosevelt Counties. This flyer was distributed by NMED Communications Staff to several media outlets, as well as through the New Mexico Department of Agriculture's networks. Several media outlets published the flyer on their sites, as did Curry County. This outreach resulted in several private well owners volunteering 47 different wells for this sampling program. In addition to the NMED recruitment efforts, the CWPC provided NMED with a signature list of 19 individuals or businesses that had expressed interest in this well sampling program. NMED contacted all prospective participants on the CWPC list, 10 of whom agreed to take part in the sampling program.

Sample collection and analysis

The sampling program in Curry and Roosevelt counties tested for 28 different PFAS compounds. PFAS sampling at private wells started on April 12, 2021. DWB's experienced PFAS sampler completed sampling of 34 wells on May 5, 2021. In addition, USGS collected PFAS samples from 23 wells, two of which were sampled twice – once by DWB and once by USGS. USGS also collected complete geochemical suite samples, including stable isotopes, at four sites. These additional samples will help NMED and USGS to better understand water recharge and origin in the local aquifer. The sampling activities for this project concluded on June 9, 2021. All samples were sent by NMED and USGS to laboratories using accredited analytical methods for the 28 PFAS compounds. After laboratory analysis, a committee of NMED PFAS data specialists reviewed all analytical results.

Sampling results

Out of 57 total results, nine private wells had detections of PFAS (Map 1 and Table 1). The maximum total PFAS concentration detected at any single well during this sampling effort was 7.4 parts per trillion (ppt) or nanograms per liter (ng/L).

EPA has established a Lifetime Health Advisory level of 70 ppt for PFOA and PFOS. Neither of those contaminants were detected in any of the samples collected during this study.

In addition to the evaluation with EPA's Lifetime Health Advisory Level, these PFAS samples returned concentrations that are well below the most stringent standards of states that have established state specific PFAS standards. Those state specific standards are shown in Table 2. The comparison of these results to other state standards are as follows:

- On average, the results for PFBS in the Curry-Roosevelt samples were 280 times lower than the most stringent standards that have been established by Michigan.
- On average, the results for PFBA were about 4,100 times lower than the most stringent health-based standard in Minnesota.
- On average, the results for PFHxA were about 350,000 times lower than the most stringent standards that have been established by Michigan.
- PFHpA was detected in only one sample at a level that is about 20 times lower the most stringent standard established by Massachusetts.

The other PFAS contaminant detected in the Curry-Roosevelt samples, PFPeA, does not have established drinking water health advisory levels nor state-specific drinking water standards in those states that have established PFAS standards.

Following the sampling and subsequent analysis by the certified laboratories, NMED notified well owners via email or hard copy mail about their results. If PFAS were detected, NMED provided the private well owner with a PFASS information sheet to help the well owner understand the quality of their water. The results for the complete geochemical suite are expected to be finalized by the certified lab by late October 2021.

*For more information about **this report**, please contact:*

Drinking Water Bureau
New Mexico Environment Department
505-660-3391, PFAS program
NMENV-DWB-PFAS@state.nm.us
https://www.env.nm.gov/pfas/

*For more information about **PFAS and health effects**, please contact:*

Epidemiology and Response Division
New Mexico Department of Health
doh-eheb@state.nm.us
https://nmtracking.org/environment/PFCS.html

Map 1. Samples with no PFAS detected (green dots) and samples with PFAS detected (red dots).

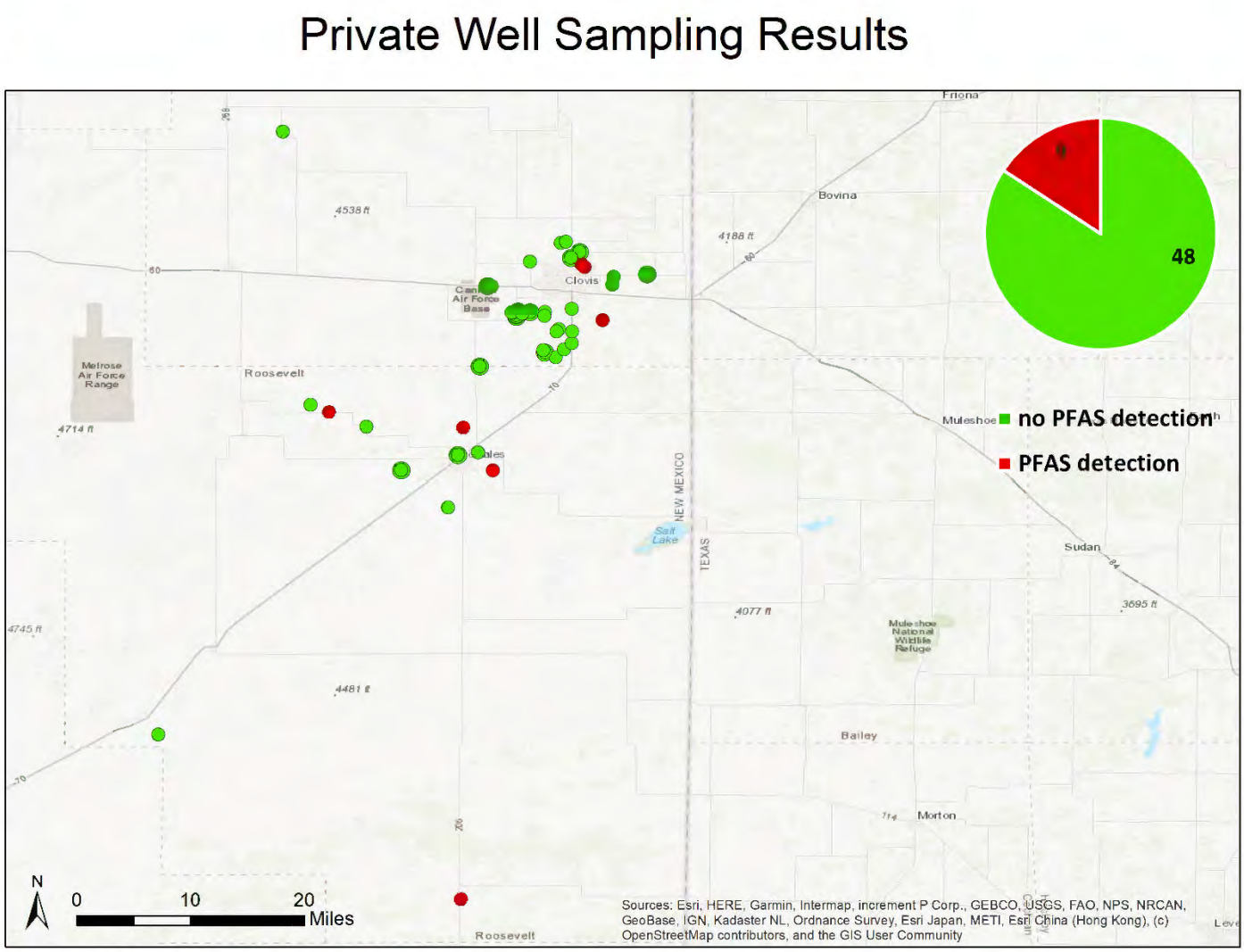


Table 1. Curry-Roosevelt samples with PFAS detections.

Private Well ID #	County	Sampling Date	Individual PFAS concentrations (ng/L)[ab]	Total PFAS concentration (ng/L)
Task 5021	Curry	2021-04-12	1.41E PFBS	1.41E
Task 5032	Curry	2021-04-12	2.15E PFPeA 1.42E PFHxA	3.53E
Task 5004 (house well)	Roosevelt	2021-04-26	1.13E PFPeA	1.13E
Task 5005 (yard well for 5004)	Roosevelt	2021-04-26	1.2E PFPeA	1.2E
Task 5016	Roosevelt	2021-04-26	2.57E PFPeA	2.57E
Task 5018	Roosevelt	2021-04-26	1.56E PFBA 3.14E PFPeA 1.72E PFBS 1.00E PFHxA	7.42E
Task 5018 Duplicate	Roosevelt	2021-04-26	1.76E PFBA 2.97E PFPeA 1.42E PFBS	6.15E
342556103110401	Curry	2021-05-13	1.5E PFPeA 0.92E PFHxA	2.42E
342139103092501 (re-sample for Task 5032)	Curry	2021-05-19	2.4 PFPeA 1.6E PFHxA	4.0E
333700103164701	Roosevelt	2021-06-09	1.1E PFHpA	1.1E

[a] E = estimate; these values fall between the Reporting Level (RL) and Method Detection Limit (MDL). This means that the minimum concentration of an analyte can be identified, measured, and reported with 99% confidence that the analyte concentration is greater than 0, but that accurate quantitation of the concentration is not necessarily possible at this level. Equivalent to data flagged with "J" qualifiers in analytical laboratory data reports.

[b] See Appendix for individual PFAS compound explanation.

Table 2. PFAS drinking water standards in U.S. states.

State	Regulation Type	Standard(s) (ppt)	Notes
Alaska	AL	70	Applies to total or individual concentrations of PFOA and PFOS
California	NL	5 PFOA 7 PFOS	--
Connecticut	AL	70	Applies to total concentrations of PFOA, PFOS, PFNA, PFHxS, PFHpA
Illinois	HBGL	2 PFOA 14 PFOS 2,100 PFBS 140 PFHxS 560,000 PFHxA	--
Maine	Interim Standard	20	Applies to total or individual concentrations of PFOA, PFOS, PFNA, PFHxS, PFHpA, PFDA
Massachusetts	MCL	20	Applies to total or individual concentrations of PFOA, PFOS, PFNA, PFHxS, PFHpA, PFDA
Michigan	MCL	8 PFOA 16 PFOS 6 PFNA 51 PFHxS 420 PFBS 400,000 PFHxA 370 GenX	--
Minnesota	HRL (subchronic)	35 PFOA 7,000 PFBA 9,000 PFBS	--
Minnesota	HRL (chronic)	35 PFOA 300 PFOS 7,000 PFBA 7,000 PFBS	--
New Hampshire	MCL	12 PFOA 15 PFOS 18 PFHxS 11 PFNA	--
New Jersey	MCL	14 PFOA 13 PFOS 13 PFNA	--
New York	MCL	10 PFOA 10 PFOS	--

North Carolina	Health Goal	140 GenX	--
Ohio	AL	70 PFOA 70 PFOS 21 PFNA 140,000 PFBS 140 PFHxS 700 GenX	70 ppt applies to total or individual concentrations of PFOA and PFOS
Rhode Island	Interim Standard	20	Applies to total or individual concentrations of PFOA, PFOS, PFNA, PFHxS, PFHpA, PFDA
Vermont	MCL	20	Applies to total concentrations of PFOA, PFOS, PFNA, PFHxS, PFHpA
U.S. Environmental Protection Agency	LHA	70	Applies to total or individual concentrations of PFOA and PFOS

Abbreviations: AL = action level; HBGL = health-based guidance level; HRL = health risk limit; LHA = lifetime health advisory; MCL = maximum contaminant level; NL = notification level; RL = response level; SL = screening level.

NOTE: The types of PFAS drinking water regulations listed above require different actions in different states. For example, MCLs are enforceable limits for which public water systems must comply. Other standards such as action levels and health-based levels are meant to provide guidance in mitigating health risks.

APPENDIX: PFAS Analytes

Analyte	Analyte Abbreviation	CAS Number
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorononanoic acid	PFNA	375-95-1
Perfluorodecanoic acid	PFDA	335-76-2
Perfluoroundecanoic acid	PFUnDA	2058-94-8
Perfluorododecanoic acid	PFDoDA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTeDA	376-06-7
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorononanesulfonic acid	PFNS	474511-07-4
Perfluorodecanesulfonic acid	PFDS	335-77-3
4:2 Fluorotelomer sulfonate	4:2FTS	757124-72-4
6:2 Fluorotelomer sulfonate	6:2FTS	27619-97-2
8:2 Fluorotelomer sulfonate	8:2FTS	39108-34-4
Perfluorooctane sulfonamide	PFOSA	754-91-6
N-Methyl perfluorooctanesulfonamidoacetic acid	MeFOSAA	2355-31-9
N-Ethyl perfluorooctanesulfonamidoacetic acid	EtFOSAA	2991-50-6
Hexafluoropropylene oxide dimer acid (GenX)	HFPO-DA	13252-13-6
4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11CL-PF3OUdS	763051-92-9

Exhibit 10

MEMORANDUM OF AGREEMENT
BETWEEN
THE NEW MEXICO ENVIRONMENT DEPARTMENT
AND
THE UNITED STATES GEOLOGICAL SURVEY

This **MEMORANDUM OF AGREEMENT** ("Agreement") is entered into by and between the **State of New Mexico, Environment Department**, hereinafter referred to as the "Department" or "NMED," and the **United States Department of the Interior, U.S. Geological Survey**, hereinafter referred to as "USGS," and is effective as of the date of the last signatory authority.

WHEREAS, NMED is an executive agency of the State of New Mexico created under the Department of Environment Act, NMSA 1978, Sections 9-7A-1 to -15, and is authorized by the Environmental Improvement Act, NMSA 1978, Section 74-1-6(B) and (C) to enter into this Agreement for the purpose of implementing projects focused on the protection of source waters in New Mexico.

WHEREAS, USGS is a public agency created under the Organic Act (43 U.S. Code Section 31 *et seq.*), and is authorized by the United States Congress for the performance of this Agreement under 28 Stat. 398, 43 U.S.C. 36c, 43 U.S.C. 50 and 43 U.S.C. 50b, to implement the project titled "Assessment of Per- and Polyfluoroalkyl Substances in Water Resources of New Mexico," hereinafter referred to as the "Project";

WHEREAS, this agreement is exempt from the provisions of the Procurement Code in accordance with NMSA 1978, Section 13-1-98(A); and

WHEREAS, NMED and USGS desire to enter into this Agreement to accomplish the Project in the most cost-effective and administratively efficient manner.

NOW, THEREFORE, the parties mutually agree as follows:

1. Purpose.

The purpose of the Project is to collect water samples from surface water and groundwater resources throughout New Mexico in order to characterize the presence and distribution of per- and polyfluorinated compounds (PFAS), which will help to mitigate and protect drinking water sources.

2. Scope of Work.

USGS shall complete the Project in accordance with the Scope of Work Project Proposal (shown in Attachment A).

3. Disbursement of Funds.

A. NMED shall transfer to USGS funds in an amount not to exceed **$660,000** to reimburse USGS for costs actually incurred in carrying out the Project in accordance with the Scope of Work.

B. USGS shall submit to NMED invoices upon completion of each quarterly report, including receipts, for costs actually incurred in carrying out the Project in accordance with the Scope of Work. Invoices not paid within 60 days will bear Interest, and other fees required by Federal Law, at the annual rate pursuant the Debt Collection Act of 1982, (codified at 31 U.S.C. § 3717) established by the U.S. Treasury. Invoices/receipts shall be submitted to:

Jacob Weathers
Drinking Water Bureau
New Mexico Environment Department
P.O. Box 5469
Santa Fe, New Mexico 87502-5469
Office (505) 476-8722
NMENV-DWBCapDevContract@state.nm.us

4. Term.

This Agreement shall not take effect until accepted and signed by all parties. This Agreement shall terminate on September 30, 2022**,** unless terminated pursuant to paragraphs 9 or 13.

5. Reports.

USGS shall provide reports to NMED, including, but not limited to, task completion progress, reasons for delay of task implementation (if any), expenditures on Project implementation, and results of Project implementation. Reports will be provided to NMED monthly and quarterly. Upon request, such reports shall also be provided to members of the public. Task deliverables and quarterly reports shall be submitted to:

Jill Turner
Sustainable Water Infrastructure Group (SWIG) Manager
NMED Drinking Water Bureau
Office (505) 476-8623
Cell (505) 205-6964
NMENV-DWBCapDevContract@state.nm.us

6. Strict Accountability.

USGS shall maintain fiscal records consistent with generally accepted accounting principles ("GAAP") and shall account for all receipts and disbursements of funds transferred pursuant to this Agreement. Along with NMED, USGS shall be strictly accountable for all receipts and disbursements under this Agreement through the end of the fiscal year following the termination of the Agreement.

7. Access to Records.

NMED, the USGS, the New Mexico Department of Finance and Administration, or the State Auditor, through any authorized representative, shall be granted access to and have the right to examine all books, papers, or documents related to this Agreement.

8. Amendment.

This Agreement shall not be altered, changed or amended except by instrument in writing executed by the parties hereto. Neither NMED nor USGS is obligated to fund any changes and/or modifications not approved in writing by both parties.

9. Termination.

A. Termination. This Agreement may be terminated by either of the parties hereto upon written notice delivered to the other party at least thirty (30) days prior to the proposed termination date. This Agreement may be terminated immediately upon written notice to USGS if USGS becomes unable to perform the services within the Scope of Work, as determined by NMED or if, during the term of this Agreement, USGS or any of its officers, employees or agents is indicted for fraud, embezzlement or other crime due to misuse of state funds or due to the Appropriations paragraph, paragraph 13, herein. *THIS PROVISION IS NOT EXCLUSIVE AND DOES NOT WAIVE THE STATE'S OTHER LEGAL RIGHTS AND REMEDIES CAUSED BY USGS'S DEFAULT/BREACH OF THIS AGREEMENT.*

B. Termination Management. Immediately upon receipt by either NMED or USGS of notice of termination of this Agreement, USGS shall: 1) not incur any further obligations for salaries, services or any other expenditure of funds under this Agreement without written approval of NMED; 2) comply with all directives issued by NMED in the notice of termination as to the performance of work under this Agreement; and 3) take such action as NMED shall direct for the protection, preservation, retention or transfer of all property titled to NMED and records generated under this Agreement. Any non-expendable personal property or equipment provided to or purchased by USGS with contract funds shall become property of NMED upon termination and shall be submitted to NMED as soon as practicable.

10. Applicable Law.

This Agreement is subject to interpretation under applicable State and Federal laws. Where there is inconsistency between the laws, Federal law is controlling. The Parties agree that the courts of the United States shall have jurisdiction over any claims arising out of work under this Agreement. Any procurement made by USGS pursuant to this Agreement shall be made in accordance with applicable procurement policies and procedures, applicable federal laws and regulations, and applicable provisions in the Scope of Work.

11. Liability.

Each party shall be liable for its own actions incurred as a result of its negligence, acts or omissions in connection with this Agreement. Liability of the USGS shall be governed by the Federal Tort Claims Act, 28 U.S.C. §§ 2671-2680. Any liability incurred by NMED in connection

with this Agreement is subject to the immunities and limitations of the New Mexico Tort Claims Act, NMSA 1978, Sections 41-4-1 to -30.

12. Equal Opportunity Compliance.

A. USGS shall abide by all state and federal laws and regulations pertaining to equal employment opportunity. In accordance with these laws and regulations, USGS shall assure that no person in the United States shall, on the grounds of race, color, national origin, sex, age, sexual preference or handicap, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity related to this Agreement. If USGS is found not to be in compliance with these requirements during the life of the Agreement, USGS agrees to take appropriate steps to correct these deficiencies.

B. Any person, group, or organization that signs this Agreement shall comply with the following federal statutes: Title VI of the Civil Rights Act of 1964, Section 13 of the Federal Water Pollution Control Act Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972 and their implementing regulations at 40 C.F.R. Parts 5 and 7, where applicable.

13. Appropriations.

The terms of this Agreement are contingent upon sufficient appropriations and authorization from the U.S. Environmental Protection Agency. If authorization or sufficient appropriations are not granted, this Agreement shall be terminated upon written notice from NMED. The decision as to whether sufficient appropriations/authorizations are available is at the sole discretion of NMED and shall be final and binding.

14. Participation in Similar Projects.

This Agreement in no way restricts USGS or NMED from entering into other Agreements with other public or private agencies, organizations, and individuals, or participating in similar projects.

15. Authority.

The representatives of the public entities below represent that they have the authority to bind their department or agency, and that no further action, resolution, or approval is necessary to enter into this Agreement.

THE PARTIES HERETO HAVE EXECUTED THIS AGREEMENT:

STATE OF NEW MEXICO, ENVIRONMENT DEPARTMENT

By: Jennifer Pruett Digitally signed by Jennifer Pruett Date: 2020.08.04 10:54:41 -06'00' Date: _____

James C. Kenney, Secretary
New Mexico Environment Department

By: Marlene Velasquez Digitally signed by Marlene Velasquez Date: 2020.08.04 08:01:28 -06'00' Date: _____

Marlene Velasquez, Chief Financial Officer
New Mexico Environment Department

Approved as to Form and Legal Sufficiency:

By: Jennifer Hower Digitally signed by Jennifer Hower Date: 2020.08.04 08:25:51 -06'00' Date: _____

Jennifer L. Hower, General Counsel
New Mexico Environment Department

U.S. DEPARTMENT OF THE INTERIOR, U.S. GEOLOGICAL SURVEY

By: MEGHAN ROUSSEL Digitally signed by MEGHAN ROUSSEL Date: 2020.08.05 11:17:37 -05'00' Date: 8/5/2020

Meghan C. Roussel
Acting Director
United States Geological Survey
New Mexico Water Science Center

United States Department of the Interior
U.S. GEOLOGICAL SURVEY
New Mexico Water Science Center
DUNS 025287520
6700 Edith Blvd. NE Bldg B
Albuquerque, NM 87113

August 5, 2020

Jill Turner
New Mexico Environment Department
1190 South Saint Francis Drive
Santa Fe, NM 87502

Dear Ms. Turner,

Enclosed are four copies of the Memorandum of Agreement (MOA) 21-667-2080-0001 and Joint Funding Agreement (JFA), 20RGJFA18 to begin the first day of the last signature and end on September 30, 2022. The MOA/JFA is to implement the project titled, "Assessment of Per- and Polyfluoroalkyl Substances in Water Resources of New Mexico."

The MOU/JFA amount of is $660,000 which will be provided by the New Mexico Environment Department. Work performed with funds from this agreement will be conducted on a reimbursable basis. The New Mexico Environment Department will be billed quarterly for work completed as part of the agreement.

If you have any questions concerning this project, please call Ms. Kimberly Beisner at (505) 830-7945. Administrative questions should be addressed to Ms. Susan Kell at (505) 830-7904.

Sincerely,

Meghan Roussel

Meghan C. Roussel
Acting Director,
New Mexico Water Science Center

A PROPOSAL AND SCOPE OF WORK SUBMITTED TO:
New Mexico Environment Department

Assessment of Per- and Polyfluoroalkyl Substances in Water Resources of New Mexico

https://www.usgs.gov/media/images/indian-paintbrush-front-rio-chama-new-mexico

U.S. Geological Survey
New Mexico Water Science Center
USGS Contact: Robert Henrion, Kimberly Beisner and Rebecca Travis
July, 2020

Summary

Problem. Per- and polyfluoroalkyl substances (PFAS) are a group of anthropogenic chemicals that are present in a number of consumer products and industrial applications and have been found in a variety of water resources throughout the United States (Boone and others, 2019). PFAS have been detected in public and private drinking water supplies, springs, and surface waters in New Mexico (New Mexico Environment Department, 2020; Intellus New Mexico, 2020). While there are known areas in New Mexico that are affected by PFAS, the presence and distribution of per- and polyfluoroalkyl substances in water resources across the state of New Mexico are not well characterized.

Objectives. The objectives of this proposed work are to collect water samples from surface water and groundwater resources throughout New Mexico, from areas that are known to be affected by PFAS (New Mexico Environment Department, 2020) and areas that have not been characterized, and determine the extent of PFAS, if present, in those resources. The samples will be collected, analyzed, and reviewed in FY2020 and FY2021. Data will be made publicly available as preliminary results are released from the laboratories, reviewed, and approved. A summary of data analysis and interpretation will be presented in a final study report in FY2022.

Approach. Water quality samples will be collected from surface water and groundwater sites throughout New Mexico. Locations were selected to include areas that may already be affected and areas of unknown impact. Surface water sampling will occur at U.S. Geological Survey (USGS) streamgaging stations and groundwater sampling will occur in unconfined water-table aquifers at wells with known depth and screened interval. Some of the surface water samples will be water quality samples already planned to be collected for other studies, which will now include the addition of sample collection for per- and polyfluoroalkyl substances. Additional sampling trips will be made to collect per- and polyfluoroalkyl substances and wastewater tracers along the Rio Grande, Pecos, San Juan, and Animas Rivers. Groundwater will be sampled for a geochemical suite in addition to per- and polyfluoroalkyl substances to help provide context for groundwater age and groundwater evolution. Following two years of sample collection, the data will be compiled and analyzed in a USGS Scientific Investigations Report or Journal article. The project will be conducted in cooperation with the New Mexico Environment Department and the cost of the proposed project is $190,862 for July through September FY2020, $169,138 for October through December 2020, $200,000 for January through September 2021, and $100,000 for FY2022.

Relevance and Benefits. Sampling of water resources for per- and polyfluoroalkyl substances on this scale has never before been conducted in New Mexico and information gained from sampling is crucial for understanding the distribution throughout the state. The proposed work also includes comprehensive analytical suites in addition to per- and polyfluoroalkyl substances to provide context for the geochemical evolution and possible sources of water contributing to the sampled water. The study directly supports the USGS Water Science Strategy by gaining an understanding of the effects of human activities on water quality.

Introduction

In New Mexico, water resources are scarce and can be particularly vulnerable to input from anthropogenic compounds. Water quality is a function of local geology as well as discharges from urban and agricultural regions. Drinking water in the state is obtained from both surface water and groundwater sources.

Per- and polyfluoroalkyl substances (PFAS) are widespread anthropogenic chemicals that have been in use for the past 70 years (Lindstrom and others, 2011). This class of compounds comprises thousands of chemicals including perfluorosulfonates (PFSAs) such as perfluorooctane sulfonate (PFOS), perfluorocarboxylic acids (PFCAs), and perfluorooctanoic acid (PFOA; Wang and others, 2017). As the use of these chemicals has grown so has their ubiquity in the environment due to their highly persistent nature (Lindstrom and others, 2011). PFOAs and PFOS have been investigated by the U.S. Environmental Protection Agency (EPA) and are considered harmful to human health and the environment (EPA, 2020). Point sources, such as firefighting training grounds, industrial facilities, and wastewater plant effluent have been found to contribute PFAS into the water cycle, including runoff and groundwater infiltration (Hu and others, 2016). At 25 drinking water plants across the United States, Boone and others (2019) analyzed paired samples from sources and after treatment, and detectable PFAS were found in all samples. There is evidence that exposure may lead to reproductive and developmental problems as well as liver, kidney, and immunological effects (EPA, 2020).

Problem

Per- and polyfluoroalkyl substances are a group of anthropogenic chemicals that are present in a number of consumer products and industrial applications and have been found in a variety of water resources throughout the United States (Boone and others, 2019). PFAS have been detected in public and private drinking water supplies, springs and surface waters in New Mexico (New Mexico Environment Department, 2020; Intellus New Mexico, 2020). While there are known areas in New Mexico that are affected by PFAS, the presence and distribution of per- and polyfluoroalkyl substances in water resources across the state of New Mexico are not well characterized.

Objectives and Scope

The objectives of this proposed work are to collect water samples from surface water and groundwater resources throughout New Mexico, from areas that are known to be affected by PFAS (New Mexico Environment Department, 2020) and areas that have not been characterized, and determine the extent of PFAS, if present, in those resources. The samples will be collected in FY2020 and FY2021 and released as preliminary data to the publicly available NWIS database and then will be reviewed and approved. Following collection of water quality data, the data will be analyzed in a comprehensive interpretive report in FY2022.

Approach

Water-quality samples will be collected in FY2020 and FY2021 throughout the state of New Mexico from both surface water and groundwater sites. Locations were selected to cover urban, agricultural, and undeveloped areas to encompass a spectrum of anthropogenic activities (New Mexico Environment Department, 2020; Intellus New Mexico, 2020).

Task 1: Sample Collection

Water samples will be collected at sampling sites throughout the state of New Mexico at both surface water and groundwater sites (figure 1). Some samples will be collected at sites that are already being sampled by USGS for other studies and others will be at sites not currently sampled. Additional samples may be collected based on water-quality results obtained from planned sampling.

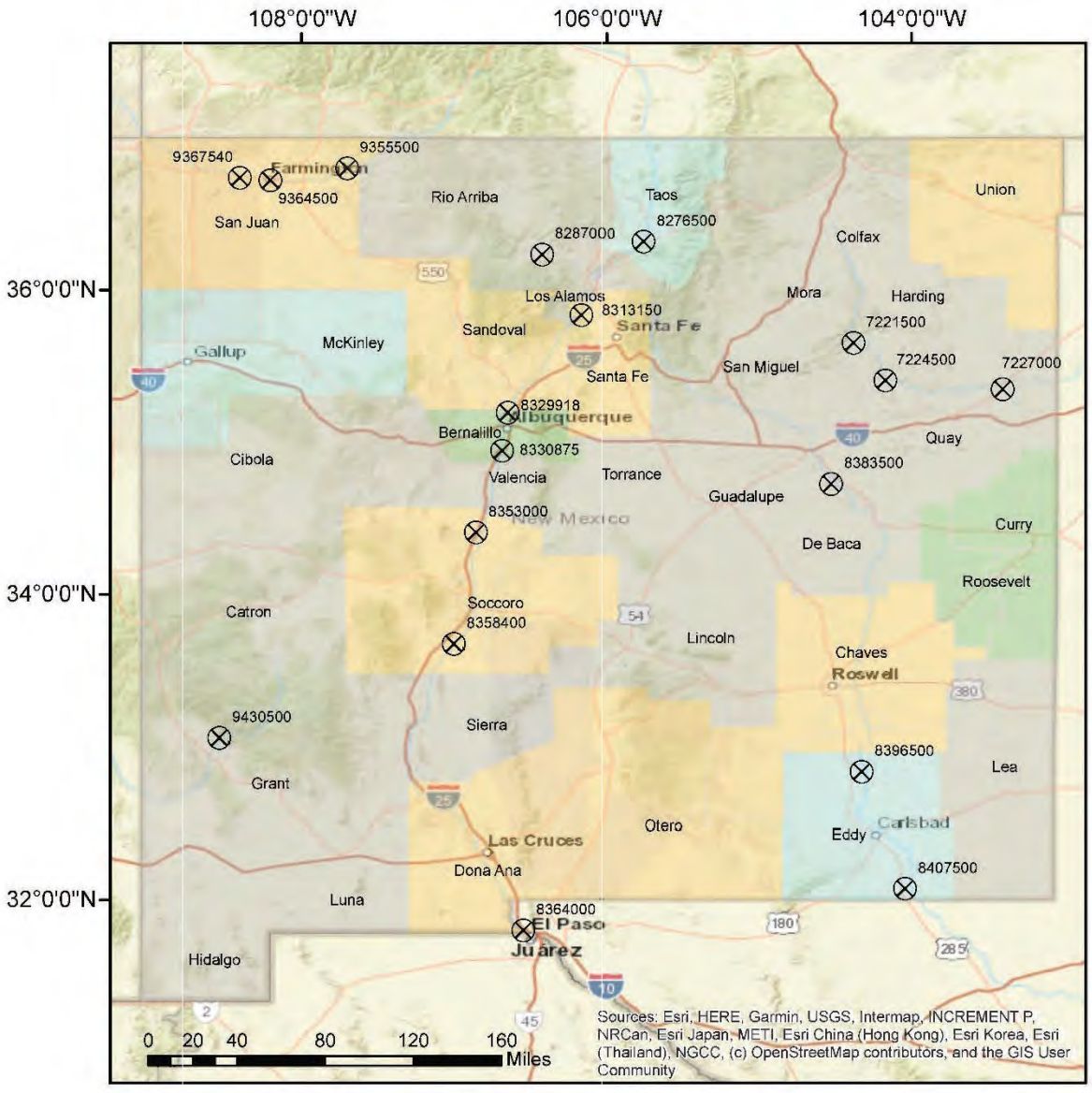


Figure 1. Map showing proposed sampling locations and areas (circles with X inside represent surface water sites with associated USGS site identification number; orange shaded counties will include groundwater sampling in 2020, blue in 2021 and green in both years)

Surface water samples will be collected from established USGS streamgage stations where a stage-discharge relationship has been established, and samples will be collected during stable flow when possible. Surface water sampling sites with established sampling history and data will be sampled for PFAS analysis and are listed in black in table 1. Additional samples will be collected at upstream and downstream locations along the Rio Grande, Pecos, and San Juan Rivers to have a monthly record of PFAS concentrations at those sites (green samples in table 1). The additional samples will include field parameters (temperature, pH, specific conductance, dissolved oxygen, and turbidity), PFAS, boron isotopes, and wastewater tracers.

Table 1. Surface-water sampling sites (Rv, River; nr, near; blw, below).

Site	**Site Name**	**Number of Samples (black – existing additional water quality data site and green – additional water quality data site)**	
		2020*	2021
07221500	Canadian Rv nr Sanchez, NM	1	0
07224500	Canadian Rv blw Conchas Dam, NM	1	0
07227000	Canadian Rv nr Logan, NM	2	2
08276500	Rio Grande blw Taos Junction Bridge nr Taos, NM	1	1
08313150	Rio Grande above Buckman Diversion, NM	5	5
08329918	Rio Grande Alameda Bridge at Alameda, NM	2 (3)	3 (2)
08330830	Rio Grande at Valle de Oro, NM	4	4
08353000	Rio Puerco nr Bernardo, NM	1	1
08358400	Rio Grande Floodway at San Marcial, NM	1	1
08364000	Rio Grande at El Paso, TX	7	5
08383500	Pecos Rv nr Puerto de Luna, NM	1 (3)	1 (2)
08396500	Pecos Rv nr Artesia, NM	1 (3)	1 (2)
08407500	Pecos Rv at Red Bluff, NM	1	0
09430500	Gila Rv nr Gila, NM	1	0
09364500	Animas Rv at Farmington, NM	1 (3)	1 (2)
09355500	San Juan Rv nr Archuleta, NM	2 (3)	3
09367540	San Juan Rv nr Fruitland, NM	5	6
08287000	Rio Chama below Abiquiu Reservoir	2	2
	Total	**34 (20)**	**31 (13)**

* Samples collected in 2020 will be distributed equally through the last quarter of Fiscal Year 2020 (July through September) and the first quarter of Fiscal Year 2021 (October through December 2020).

Groundwater sampling areas are listed in table 2 and will include an additional suite of analytes to understand more holistically the groundwater evolution and potential sources of water. The distribution of groundwater samples is spread throughout New Mexico to encompass urbanized, agricultural, and undeveloped areas (figure 1). Groundwater samples will be collected from unconfined water-table aquifers at sites with known drillers' logs and screened interval information. Groundwater-level measurements will be made prior to collection of water quality samples at sites with accessible groundwater level measurement ports. Preference will be to sample groundwater wells with a dedicated pump, but samples can be collected with portable pumps if needed. Groundwater samples will be collected as raw water prior to inline chlorination and storage tanks.

Additional analytes for groundwater samples will include major ions, trace elements (Al, Ag, As, Ba, Be, Cd, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sb, Se, U, V, and Zn), nutrients, dissolved organic carbon, boron isotopes, stable isotopes of oxygen and hydrogen, tritium, and carbon-14.

Table 2. Proposed groundwater sample collection by county in New Mexico

County	**Proposed number of samples**	
	2020*	2021
Bernalillo	1	2
Chaves	3	
Curry	8	4
Dona Ana	2	
Eddy		1
McKinley		2
Otero	6	
Roosevelt	8	4
Sandoval	2	
San Juan	3	
Santa Fe	2	
Socorro	2	
Taos		2
Union	1	
Total	**38**	**15**

* Samples collected in 2020 will be distributed equally through the last quarter of Fiscal Year 2020 (July through September) and the first quarter of 2021 (October through December 2020).

Task 2: Data Analysis and Review

PFAS analysis will include a group of 28 per- and polyfluoroalkyl substances (Table 3) analyzed by SGS, a subcontract laboratory through RTI, using EPA Method 537.1 (US Environmental Protection Agency, 2018). Since per- and polyfluoroalkyl substances show variability between analytical laboratories, a subset of the samples could be sent to the USGS National Water Quality Laboratory in Lakewood, CO (USGS-NWQL) for analysis by their PFAS method if USGS matching funds are available to cover the cost of analysis. Major ion, trace element, nutrient, and dissolved organic carbon will be analyzed at the USGS-NWQL. Boron isotopes will be analyzed at the USGS research laboratory at Moffett Field, CA. Stable isotopes of oxygen and hydrogen will be analyzed at the USGS Stable Isotope Laboratory in Reston, VA. Tritium will be analyzed at the University of Miami (contract lab for USGS-NWQL). Carbon-14, in addition to carbon-13/carbon-12 ratios, will be analyzed at Woods Hole Oceanographic Institute (contract laboratory for USGS-NWQL). Wastewater tracers will be analyzed at the USGS Aqueous Chemical Contaminants and Hydrological/Ecological Interactions research laboratory in Boulder, CO.

Table 3. Per- and polyfluoroalkyl substances analyzed by SGS.

Analyte	Analyte Abbreviation	CAS Number*
Perfluorobutanoic acid	PFBA	375-22-4
Perfluoropentanoic acid	PFPeA	2706-90-3
Perfluorohexanoic acid	PFHxA	307-24-4
Perfluoroheptanoic acid	PFHpA	375-85-9
Perfluorooctanoic acid	PFOA	335-67-1
Perfluorononanoic acid	PFNA	375-95-1
Perfluorodecanoic acid	PFDA	335-76-2
Perfluoroundecanoic acid	PFUnDA	2058-94-8
Perfluorododecanoic acid	PFDoDA	307-55-1
Perfluorotridecanoic acid	PFTrDA	72629-94-8
Perfluorotetradecanoic acid	PFTeDA	376-06-7
Perfluorobutanesulfonic acid	PFBS	375-73-5
Perfluoropentanesulfonic acid	PFPeS	2706-91-4
Perfluorohexanesulfonic acid	PFHxS	355-46-4
Perfluoroheptanesulfonic acid	PFHpS	375-92-8
Perfluorooctanesulfonic acid	PFOS	1763-23-1
Perfluorononanesulfonic acid	PFNS	474511-07-4
Perfluorodecanesulfonic acid	PFDS	335-77-3
4:2 Fluorotelomer sulfonate	4:2FTS	757124-72-4
6:2 Fluorotelomer sulfonate	6:2FTS	27619-97-2
8:2 Fluorotelomer sulfonate	8:2FTS	39108-34-4
Perfluorooctane sulfonamide	PFOSA	754-91-6
N-Methyl perfluorooctanesulfonamidoacetic acid	MeFOSAA	2355-31-9
N-Ethyl perfluorooctanesulfonamidoacetic acid	EtFOSAA	2991-50-6
Hexafluoropropylene oxide dimer acid (GenX)	HFPO-DA	13252-13-6

4,8-dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid	9Cl-PF3ONS	756426-58-1
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid	11CL-PF3OUdS	763051-92-9

*This table contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client ServicesSM.

Data collected during the sample collection campaign in 2020 and 2021 will be released as preliminary data to the publicly available NWIS database and then will be reviewed and approved. Rerun and verification requests will be made for data with issues that arise during the review process and will be documented and values updated as necessary.

Task 3: Interpretations and Reporting

Quarterly reports will be sent to the New Mexico Environment Department describing sample collection with links to the publicly available data in NWIS. Approved data will be analyzed and interpreted in a USGS Scientific Investigations Report or Journal article. The report will assess the comprehensive geochemical and anthropogenic data collected during this project.

Additional work (beyond the scope of this proposal)

1. Investigate per- and polyfluoroalkyl substances and other anthropogenic compounds (wastewater tracers, pesticides, artificial sweeteners) in the Rio Grande as it flows through the Albuquerque metropolitan area. The study would include sites upstream and downstream from the urbanized area and at targeted sites through the city. Sites downstream from wastewater treatment plant inflows could benefit from hourly sampling for a 24-hour or longer period at different flow regimes to understand if there are fluctuations in the anthropogenic compounds over a daily cycle and could help structure timing for future sampling. The work could benefit from USGS matching funds that support the Urban Waters Federal Partnership: https://www.epa.gov/urbanwaterspartners/urban-waters-and-middle-rio-grandealbuquerque-new-mexico
2. Sample playa lakes in Roosevelt and Curry counties for anthropogenic compounds in the water and sediment. These playa lakes may serve as focused recharge locations to the groundwater in this area. If so, it would be important to know the water-quality of the playa lakes.
3. Add total oxidizable precursors of per- and polyfluoroalkyl substances to the analytical suite.
4. Develop a wastewater mapper tool to understand which surface water resources may have anthropogenic compounds and utilize the proposed data set to calibrate the mapper to predict concentrations for compounds of interest. An example of a wastewater mapper tool from the Shenandoah River can be found at: https://va.water.usgs.gov/webmap/shenmap/
5. Investigate use of passive samplers for both surface water and groundwater to collect time integrated samples of per- and polyfluoroalkyl substances.
6. Increase groundwater sampling numbers in 2021 to gain additional spatial coverage.
7. Sample intermittent and ephemeral surface water after precipitation events to understand per and polyfluoroalkyl substance occurrence in those water resources.

Relevance and Benefits

Sampling for per- and polyfluoroalkyl substances on this scale has never before been conducted in New Mexico and information gained from sampling is crucial for understanding the distribution throughout the state in both areas of known impact and unknown impact (New Mexico Environment Department, 2020; Intellus New Mexico, 2020). The proposed work also includes comprehensive analytical suites in addition to per- and polyfluoroalkyl substances to provide context for the geochemical evolution and possible sources of water contributing to the sampled water. The study directly supports the USGS Water Science Strategy by gaining an understanding of human interactions on water quality.

Quality Assurance Plan

Quality assurance (QA) measures will be followed to ensure completeness of the information communicated during the study. The QA objectives for collection and communication of information will:

- Withstand scientific scrutiny
- Be obtained by methods appropriate for the information and its intended use, and
- Be representative and of known completeness and comparability.

All data will be collected in adherence to USGS standards and methods and water quality samples will be collected according to the USGS National Field Manual for the Collection of Water Quality Data (USGS, variously dated). Collection methods for per- and polyfluoroalkyl substances are still being evaluated prior to publication in the USGS National Field Manual and sampling will follow the best available guidance and include the use of shoulder length gloves beneath the standard nitrile gloves during sampling. Groundwater samples for per- and polyfluoroalkyl compounds will be collected directly from the sampling port at wells with a dedicated pump and utilize HDPE tubing for samples collected with a portable pump. If a portable pump is used, a blank sample will be collected from the pump prior to sample collection. Surface water samples will be collected following the USGS National Field Manual using polypropylene equipment.

All digital data will be reviewed by USGS personnel to ensure proper documentation. The project and project budget will be reviewed by USGS management on a semi-annual basis to ensure project timelines are met. USGS products are impartial, credible, relevant, provide timely information, and are equally accessible and available to all interested parties.

Quality assurance samples provide important context for the environmental samples to understand potential contamination from sampling equipment or ambient sources near sampling sites (blanks) and variability of concentrations at each site (replicates). For surface water samples, 10 blanks and 10 replicates will be collected during 2020 including wastewater tracers during 4 sampling events. In 2021, 4 blanks and 4 replicates will be collected from surface water sampling sites. Groundwater samples will be collected at a range of urban, agricultural, and undeveloped sites with 4 blanks and 4 replicates in 2020 and 2 blanks and 2 replicates in 2021.

Deliverables

Deliverables will follow tasks 1-3 as described above; 1) sample collection, 2) sample results, and 3) interpretive report. Water quality and water level data will be entered into USGS National

Water Information System (NWIS), and the data will be publicly available as the results are released from the laboratories as preliminary data, then reviewed and approved. Quarterly reports will be sent to the New Mexico Environment Department providing a summary of the samples collected and links to the NWIS data. In the third year of the project, a USGS Scientific Investigations Report or Journal article will analyze and interpret the comprehensive geochemical and anthropogenic data collected during this project.

Timeline and Budget

Table 4. Timeline is based on federal fiscal year where Q1 starts October 1 and Q4 ends September 30. Proposed work will begin after finalization of Joint Funding Agreement.

Task	FY2020				FY2021				FY2022			
	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sept	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sept	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sept
Task 1: Data Collection												
Task 2: Data Analysis and Review												
Task 2: Interpretations and Reporting												

Table 5. Budget summary

	FY2020	FY2021		FY2022	Total
		Oct-Dec	Jan-Sept		
Laboratory Analysis	$66,000	$66,000	$69,400	$0	$201,400
Travel	$15,325	$15,325	$17,300	$0	$47,950
Supplies/ Shipping	$2,600	$2,600	$2,200	$0	$7,400
Personnel Hours	$106,937	$85,213	$111,100	$90,000	$393,250
USGS Publication	$0	$0	$0	$10,000	$10,000
Total	$190,862	$169,138	$200,000	$100,000	$660,000

Table 6. Contributing Source Funding

	FY2020	FY2021		FY2022	Total
		Oct-Dec	Jan-Sept		
Cooperator	$190,862	$169,138	$200,000	$100,000	$660,000
USGS	$0,000	$0,000	$0,000	$0,000	$0,000
Total	$190,862	$169,138	$200,000	$100,000	$660,000

Personnel

Experienced USGS Hydrologic Technicians who have taken the USGS Field Methods for Water Quality Sample Collection class will collect the surface water and groundwater samples. An experienced Hydrologist who specializes in water quality will oversee data collection and assist in groundwater site selection to ensure that relevant well depth, screened interval, and aquifer information are available for each sampling location. This Hydrologist will also partner with

Jeramy Jasmann, Larry Barber, and others at USGS who specialize in anthropogenic compounds during the analysis and interpretation of the data that will result in a USGS Scientific Investigations Report or Journal article.

References

Boone, J.S., Vigo, C., Boone, T., Byrne, C., Ferrario, J., Benson, R., Donohue, J., Simmons, J.E., Kolpin, D.W., Furlong, E.T., and Glassmeyer, S.T., 2019, Per- and polyfluoroalkyl substances in source and treated drinking waters of the United States: Science of the Total Environment, v. 653, p. 359–369, doi:10.1016/j.scitotenv.2018.10.245.

Hu, X.C., Andrews, D.Q., Lindstrom, A.B., Bruton, T.A., Schaider, L.A., Grandjean, P., Lohmann, R., Carignan, C.C., Blum, A., Balan, S.A., Higgins, C.P., Sunderland, E.M., 2016. Detection of poly- and perfluoroalkyl substances (PFASs) in US drinking water linked to industrial sites, military fire training areas, and wastewater treatment plants. Environmental Science & Technology Letters 3, 344–350.

Intellus New Mexico, 2020, Quick search [Data providers: Los Alamos National Laboratory, NMED DOE Oversight Bureau; Type of data: Analytical results; Type of samples: Water, Type of water: Base Flow, Ground Water, Water; Time period: 06/02/2015 to 06/02/2020; Where: Everywhere in the Los Alamos area; Analytical parameters: Select parameters from at list: Parameter Group: PFAS; Data Columns: default selected fields]: accessed at June 2, 2020, at https://www.intellusnm.com/reporting/quick-search/quick-search.cfm.

Lindstrom, A.B., Strynar, M.J., and Libelo, E.L., 2011, Polyfluorinated Compounds: Past, Present, and Future: Environmental Science & Technology, v. 45, p. 7954–7961.

New Mexico Environment Department, 2020, PFAS Data, accessed June 2, 2020, at https://www.env.nm.gov/pfas/data/.

U.S. Environmental Protection Agency, 2020, Basic Information on PFAS What are PFAS?, accessed May 1, 2020, at https://www.epa.gov/pfas/basic-information-pfas#health.

U.S. Environmental Protection Agency, 2018, Method 537.1 Determination of Selected Per- and Polyfluorinated Alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), 50p., accessed June 2, 2020, at https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=343042&Lab=NERL.

U.S. Geological Survey, variously dated, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chaps. A1-A10, available online at http://pubs.water.usgs.gov/twri9A.

Wang, Z., DeWitt, J.C., Higgins, C.P., and Cousins, I.T., 2017, A Never-Ending Story of Per- and Polyfluoroalkyl Substances (PFASs)?, Environmental Science & Technology, v. 51, p. 2508-2518.

Exhibit 11

MICHELLE LUJAN GRISHAM
GOVERNOR

JAMES C. KENNEY
CABINET SECRETARY

July 12, 2021

Susan Kell
U.S. Geological Survey
PO Box 6200-27
Portland, OR 97228-6200
skell@usgs.gov

RE: Invoice #90911779 for PFAS Assessment Project for MOA 21-667-2080-0001

Ms. Kell,

Thank you for your submission of invoice #90911779 and corresponding deliverables for the project: "Assessment of Per- and Polyflouroalkl Substances in Water Resources of New Mexico" under MOA 21-667-2080-0001, Tasks 1-5.

The deliverables and prices as outlined in the July 12, 2021 invoice in the amount of $235,376.08 meet the contract and scope of work requirements and have been accepted. Please feel free to contact me with any questions or concerns.

Sincerely,

Jill Turner Digitally signed by Jill Turner
Date: 2021.07.12 17:18:03 -06'00'

Jill Turner
Sustainable Water Infrastructure Group Manager
NMED Drinking Water Bureau
505-205-6964
Jill.turner@state.nm.us

CC:
Trina Page, DWB Financial Specialist
Mari Reimer, DWB Financial Manager
Esther Torrez, Budget Analyst, USGS, NM Water Science Center

DI-1040

UNITED STATES DEPARTMENT OF THE INTERIOR
DOWN PAYMENT (BILL) REQUEST

Bill #: 90911779
Customer: 6000003992
Date: 07/12/2021
Due Date: 09/10/2021

Make Remittance Payable To: U.S. Geological Survey
Billing Contact: Admin Officer: Susan Kell Phone: 505-830-7904

Remit Payment To: United States Geological Survey
P.O. Box 6200-27
Portland, OR 97228-6200

Payer: New Mexico Environment Dept
Drinking Water Bureau
PO Box 5469
Santa Fe NM 87502

Additional forms of payment may be accepted. Please email GS-A-HQ_RMS@USGS.GOV or call 703-648-7683 for additional information.

To pay through Pay.gov go to https://www.pay.gov.

Checks must be made payable to U.S. Geological Survey. Please detach the top portion or include bill number on all remittances.

Amount of Payment: $ _____

.....

Date	Description	Qty	Unit Price		Amount
			Cost	Per	
07/12/2021	Reimbursement for expenses incurred under the provisions of Joint Funding Agreement number 20RGJFA18 for the project "Assessment of Per- and Polyfluoroalkyl Substances in Water Resources of New Mexico." PO# 66700-0000036052 Period of Performance: May-June 2021 Tasks 1-3: $4,272.23 Task 4: $153,107.84 Task 5: 77,996.01 Total: $235,376.08 20RGJFA18	1	235,376.08	1	235,376.08
				Amount Due this Bill:	235,376.08

Accounting Classification:
Sales Order: 93088
Sales Office: GCRG
Customer: 6000003992
Accounting #: 11153263

TIN: *****0565

OK to Pay - deliverables met by 6/30/21

Jill Turner

Digitally signed by Jill Turner
Date: 2021.07.12 17:18:26 -06'00'

Exhibit 12

ORIGINAL

HALL ENVIRONMENTAL ANALYSIS LABORATORY

Hall Environmental
4901 Hawkins NE
Albuquerque, NM 87109
TEL: 505-345-3975
Website: www.hallenvironmental.com

INVOICE

Invoice#: **1811363**
Date: **11/28/2018**

INVOICE TO: ATTN: **ACCOUNTS PAYABLE**

Accounts Payable
525 Camino de los Marquez Suite 4
Santa Fe, NM 87505

Acct. Code:

Work Order: **1811363**
Date Received: 11/7/2018
Priority: Routine
Phone:
Fax:
Project: NM3567905 CAFB
PO: Entry Point 1
CaseNo: 67905017
Submitted By: NMED Drinking Water SF
Stephanie Stringer

Item Description	Matrix	Remarks	Qty	Unit Price	Total
PERFLUOROCARBONS	Aqueous		1	240.00	240.00

Sub Total:	$240.00
Misc. Charges:	$0.00
Surcharge:	0.00%
Tax:	7.875%
INVOICE Total:	**$258.90**
Pre-Paid Amount:	$0.00
Total Payable Amount:	**$258.90**

TERMS:

All invoices are due and payable net 30 days from receipt.

RECEIVED
NOV 30 2018

Ok to pay
Stephanie Stringer 11/30/18

State of New Mexico
Purchase Order

PO Number to be on all Invoices and Correspondence

Dispatch Via Print

NM Environment Department
NMED-1190 St. Francis Drive Rm. S4051
Santa Fe NM 87502
United States

Purchase Order	Date	Revision
66700-0000032565	11-01-2018	
Payment Terms	**Freight Terms**	**Ship Via**
Pay Now	FOB Destination	Best Way
Buyer	**Phone**	**Currency**
TRINA V. PAGE		USD

Supplier: 0000050567
HALL ENVIRONMENTAL ANALYSIS
4901 HAWKINS NE #D
ALBUQUERQUE NM 87109-4372
United States

Ship To: 021109
1190 St. Francis Drive
S2120
Santa Fe NM 87507
United States

Bill To: NMED-1190 St. Francis Drive Rm S4100
Santa Fe NM 87502
United States

Origin: DPO **Exc\Excl#:**

Line-Sch	Item/Description	Quantity	UOM	PO Price	Extended Amt	Due Date
1 - 1	Processing Water samples, including Perfluorinated compound analysis, and any other tests that are used for this method. 66700-06400-2080000000-535300-DWB1000- - - -119-C0000	1.00	EA	$20,000.00	$20,000.00	11/01/2018

Schedule Total	$20,000.00
Item Total	$20,000.00
Total PO Amount	$20,000.00

Agency Approval - I certify that the proposed purchase represented by this document is authorized by and is made in accordance with all State (and if applicable Federal) legislation rules and regulation. I further certify that adequate unencumbered cash and budget expenditure authority exists for this proposed purchase and all other outstanding purchase commitments and accounts payable.

Authorized Signature
Butch Tongate

Exhibit 13

Depopulation & Removal Plan with Narrative to Application for DIPP Cow Buy-Out Indemnity Benefits For Highland Dairy Cow Herd

---

Animal Deaths Caused by Cannon Air Force Base PFAS Contamination

April 19, 2022

For the Immediate Attention of:

Dr. Ralph Zimmerman
State Veterinarian
New Mexico Livestock Board
(ralph.zimmerman@state.nm.us) ((505) 841-6161)

Hon. James C. Kenney
Cabinet Secretary
New Mexico Environment Department (NMED)
(james.kenney@state.nm.us) ((505) 827-2855)

Ms. Sumer Priest
County Executive Director
Curry County (N.M.) Farm Service Agency Office
(sumer.priest@usda.gov) ((575) 762-4796)

FOR OFFICE USES ONLY
NM State Veterinarian Approved:_____ Date: 4/20/2022
NMED **For Section 9 - Removal Plan Only** Approved: [signature] Date: 5/12/2022
Curry COC Received:_____ Date:

Applicant:

Highland Dairy
c/o Mr. and Mrs. Art Schaap (general partners), 650 Curry Road O, Clovis, NM 88101
(art.schaap@icloud.com) ((505) 760-6645)

Represented by:
John B. Kern, Rutten+Kern Pol. Gr., Santa Fe, NM (jbk@ruttenkern.com) ((505) 316-4066)
Timothy M. Rutten, Rutten+Kern Pol. Gr., Wash., DC (tmr@ruttenkern.com) ((202) 251-5477)
Dr. Robert G. Hagevoort, Albuquerque, NM (dairydoc@nmsu.edu) ((806) 786-3421)

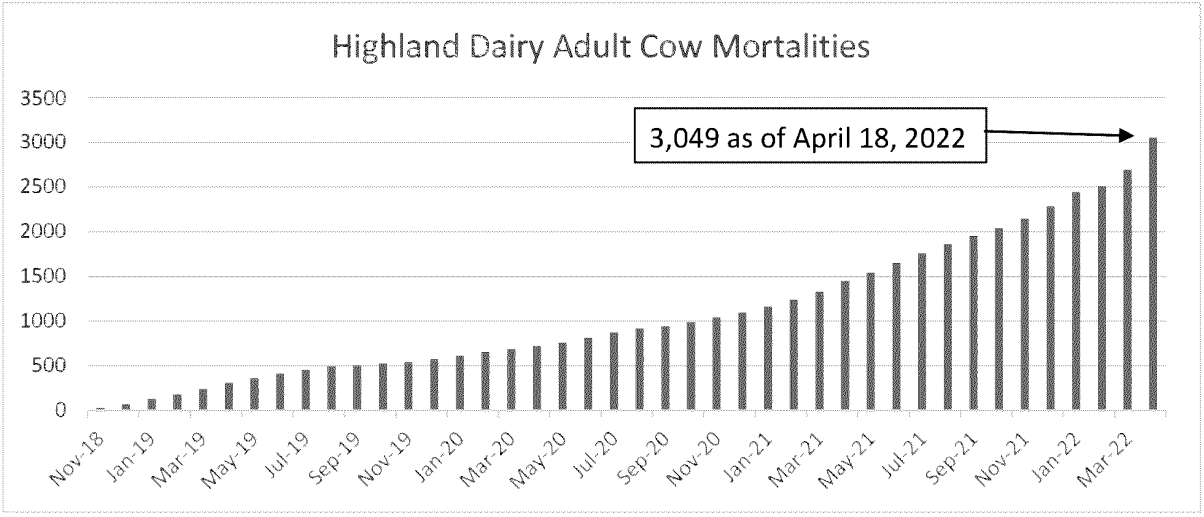


Figure 4: *Accumulated Adult Cow Death Count at Highland Dairy*

Highland determined that no landfill location in the state of New Mexico or in the Western regions of the state of Texas was eligible for the off-site storage of the PFAS-adulterated herd. It also determined that the animals could not be transported to a Subtitle C hazardous waste storage facility, including one operated by Republic Industries in Odessa, Texas, owing to the EPA's lack of leadership on this issue and the inability of the market to respond to these deaths. Mr. Schaap has repeatedly and earnestly sought solutions for these living animals characterized as 'the stranded' and 'the walking dead', while he has been compelled to feed them continuously – daily – with no financial support from the state or federal government since December 2020.7

Finally, the Applicant determined that the incineration (or cremation) of the animals in portable gas-powered furnaces (which could exceed temperatures of 1,300° F and thus break-down PFAS compounds into non-hazardous wastes) was likewise unachievable in the near term due to the high moisture content in the animals – said to be 85% – and the requirement to obtain an NMED air quality permit for the incineration operation could take considerable period of time to secure, depending upon the scale of the incineration operation.

As a result, the second site identified above in Figure 3 as the "Current Mortality Disposal Site" was elected to be used beginning in 2019. Moreover, the dairy switched to a shallow burial methodology instead of whole cow composting of the mortalities because this approach made better practical sense. The management of Highland Dairy did not know how long the quarantine would last, or whether its animals would one day be eligible for markets or milk production.

[7] Moreover, without any government aid or program for the dairy's remuneration of these quarantined animals, the Applicant has been compelled to keep them alive in order to maintain the book value of the livestock on his balance sheet in order to stave off a determination of balance sheet insolvency by his agricultural lender. The Applicant's bank has maintained a lien of $1,500 on each cow in the herd, with the aggregate value ranging from some $7.5 million in 2018 to the current remnant value of approximately $1.2 million.

Since the initial "in-house composting" of 268 adult cows that died on the dairy in the six months following the PFAS quarantine within the Historic Disposal Site, Highland has concentrated the composting of some 2,800 dead cows in the area designated as "Section 2" in its Notice of Intent to Discharge, an area with its northern boundary measuring 300' East to West, its Eastern boundary measuring 510' running North / South, its Western boundary measuring 444' running North/South and the southern boundary 345' in length with a pronounced jog to the North 116' from the Eastern boundary and 219' from the Western boundary. The GPS position is 34° 21' 31.82" N; 103° 17'37" W at an elevation of 4,259'.

Within the Current Mortality Disposal Site, Highland Dairy has three pre-existing Disposal Trenches measuring ca. 80' wide by 430' to 500' in length that have been dug as borrow pits in years past in a Northerly/Southerly direction.

Figure 5: *Storage Trenches 2(A), 2(B), and 2(C) at Highland Dairy*

The Disposal Trenches measure an average of 12' deep with gradually sloping grades on the North and South ends (allowing for vehicles to enter in order to position animal carcasses, etc.) and somewhat steeper embankments on the East and West sides. (In compliance with NRCS Code 368, all earthen walls are sloped at 2 horizontal and 1 vertical or flatter.) These trenches are labeled 2(A), 2(B) and 2(C) in the direction of West to East on the dairy.

One can see in Figure 5, a close-up aerial view of the Disposal Trench area, the pale-ivory colored *caliche* clay material which is found just below the topsoil layer throughout this area and measures an average depth of 10' to 15' below the Disposal Trench, allowing for either composting or shallow burials of these hooved animals with considerably limited opportunity for any water, blood, or other liquified carcass matter to leach into the soil.

The largest and most Easterly of the three trenches ("2(C)") has been used for the storage and decomposition of nearly all of the roughly 2,600 animals that have died on the dairy since May 2019. Over approximately the past 3 years, the deceased animals have been transported from the feedlot pens where they have died to the edge of the disposal area by the use of a front-end loader which Highland Dairy has on its premises. The animals have been accumulated into collections of 10 to 30 cows adjacent to the Disposal Trench 2(C) and on approximately a weekly basis have been repositioned into the burial area. Figure 6 shows the front-end loader transport of an individual adult cow carcass – an occurrence that has been witnessed daily on the dairy since November 2018.

Figure 6: *Transporting individual animal carcasses from the feedlots to Disposal Trench 2(C).*

Disposal Trench 2(C) Images over Time:

The following image (Figure 7) reflects a close-interval positioning of approximately 560 dead animals in Disposal Trench 2(C) as of the Summer of 2020, approximately one year after this site was put in use:

Figure 7: *Disposal Trench 2(C). Viewed from the SW Corner looking Northeast Summer 2020.*

Figure 8 below illustrates the condition of the Storage Trench 2(C) location in December 2021 with more than 1,800 dead that died of natural causes and were positioned in this location since May 2019. Note that there has not been any cover material placed on the animal carcasses to allow oxygen to enter into the carcasses and hasten the decomposition of the animals. In the middle of the trench it is possible to see the largely decomposed (and weathered) animal carcasses with newer additions placed on the north and south edges of Trench 2(C).

Figure 8: *Storage Trench 2(C) in December 2021. Cannon AFB is visible in the background.*

The following image (Figure 9) reflects a close-interval positioning of approximately 2,600 dead animals in Disposal Trench 2(C) as of April 15, 2022:

Figure 9: *Disposal Trench 2(C) showing March & April deaths layered on top of older ones (April 15, 2022)*

6. Highland Dairy's Impermeable Layer of Caliche Clay Lining the Disposal Trench

The light-yellow material visible at the base of the disposal trench is known as caliche clay, a sedimentary rock, and hardened natural cement of calcium carbonate that binds other materials – such as gravel, sand, clay and silt. It occurs in aridisol and mollisol soil orders – generally in arid or semiarid regions, such as the Llano Estacado regions of the High Plains of the western Texas and eastern New Mexico, and in particular, Curry County, New Mexico. Caliche forms where annual rainfall is less than 26 inches per year and the mean annual temperature exceeds 41° Fahrenheit. Higher rainfall totals leach excess calcium completely from the soil, while in arid climates, rainfall is inadequate to leach calcium at all and only thin layers of calcite are formed. Plant roots play an important role in caliche formation, by releasing large amounts of carbon dioxide into the layer of soil just below the organic matter layer. Carbon dioxide levels here can exceed 15 times normal atmospheric values. This allows calcium carbonate to dissolve as bicarbonate.

As in eastern New Mexico, where rainfall is adequate but not excessive (on average 18.51" per year), the calcium bicarbonate is carried down into the level of soil where there is significantly less biological activity. The carbon dioxide level is much lower, and the bicarbonate reverts to insoluble carbonate. A mixture of calcium carbonate and clay particles accumulates, first forming grains, then small clumps, then a discernible layer, and finally, a thicker, solid bed. As the caliche layer forms, the layer gradually becomes deeper, and eventually moves into the underlying, consolidated geological material in which soil horizons form.

In the Highland Dairy area, the caliche layer is substantial – measuring some 10' to 15' in depth and is reached between 3' and 8' below the upper soil horizon. The impermeable layer of caliche clay sediment prevents water from draining, and from an agricultural perspective, prevents deep root systems from getting adequate oxygen. Salts can also build up in the soil due to the lack of drainage. The impermeable nature of caliche beds prevents plant roots from penetrating the bed, which limits the supply of nutrients, water, and space so they cannot develop normally. The Applicant contends that this 15' thick layer of cement is superior to any engineered product that could be applied to the Disposal Trenches.

7. Pervasive Prior Contamination of Air Force PFAS in Highland Dairy Water & Soils

The agricultural pivots on Highland Dairy have been contaminated by PFAS from the Air Force's 50 years of application to the soils with no remediation. The Applicant has exhaustingly sought the intervention of the US Air Force into this debacle and inhumane result of its disregard for the environment or the lives of those people and animals occupying Highland Dairy – all to an astoundingly deaf response. New Mexico's congressional delegation has sought to likewise hold the Air Force and the Department of Defense to account – with legislative actions that have been largely ignored.

For example, the 2020 National Defense Authorization Act required that the Air Force treat agricultural water with the same regard as drinking water pursuant to the US Safe Drinking Water Act and the EPA's Lifetime Health Advisory level of 70 parts per trillion. While Highland's water scores are well in excess of this limit, the US Air Force has done nothing to mitigate the problems faced by the dairy.

The following Figure 10 reflects the Air Force's own findings of water samples taken from Highland Dairy in 2018 and 2021.

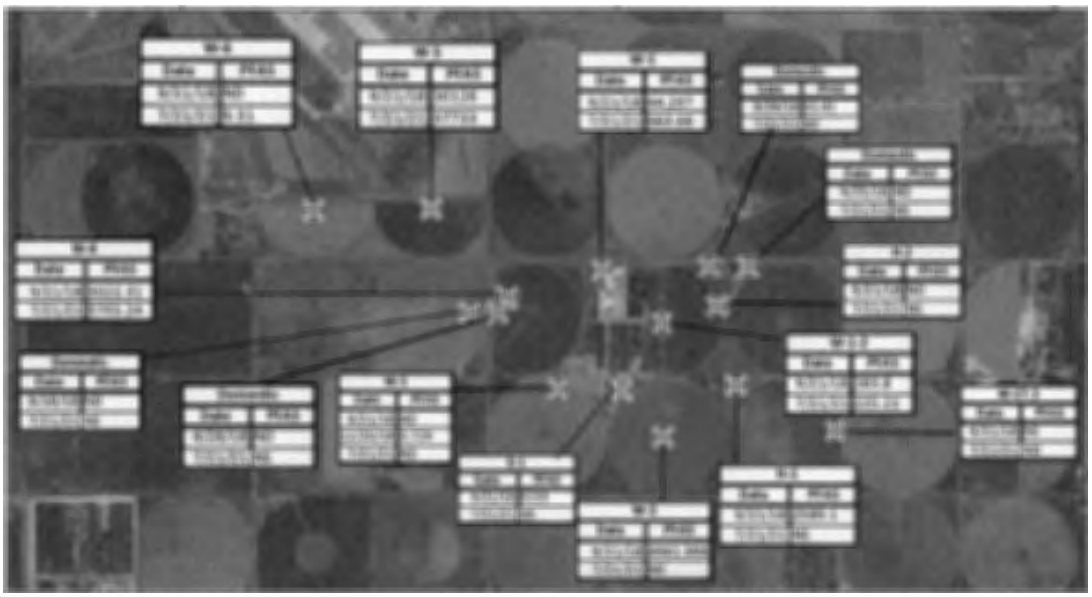


Figure 10: *Recent US Air Force Sampling of Water at Highland Dairy*

Likewise, the soils surrounding the Disposal Trenches have, correspondingly, already been contaminated with high concentrations of PFAS (PFOA and PFOS) emanating from Cannon Air Force Base into the Ogallala Aquifer and through the distribution of this water through the agricultural watering systems (pivots) utilized by Highland Dairy over the years. Figure 10 shows the soil test results from Nov. 2021.

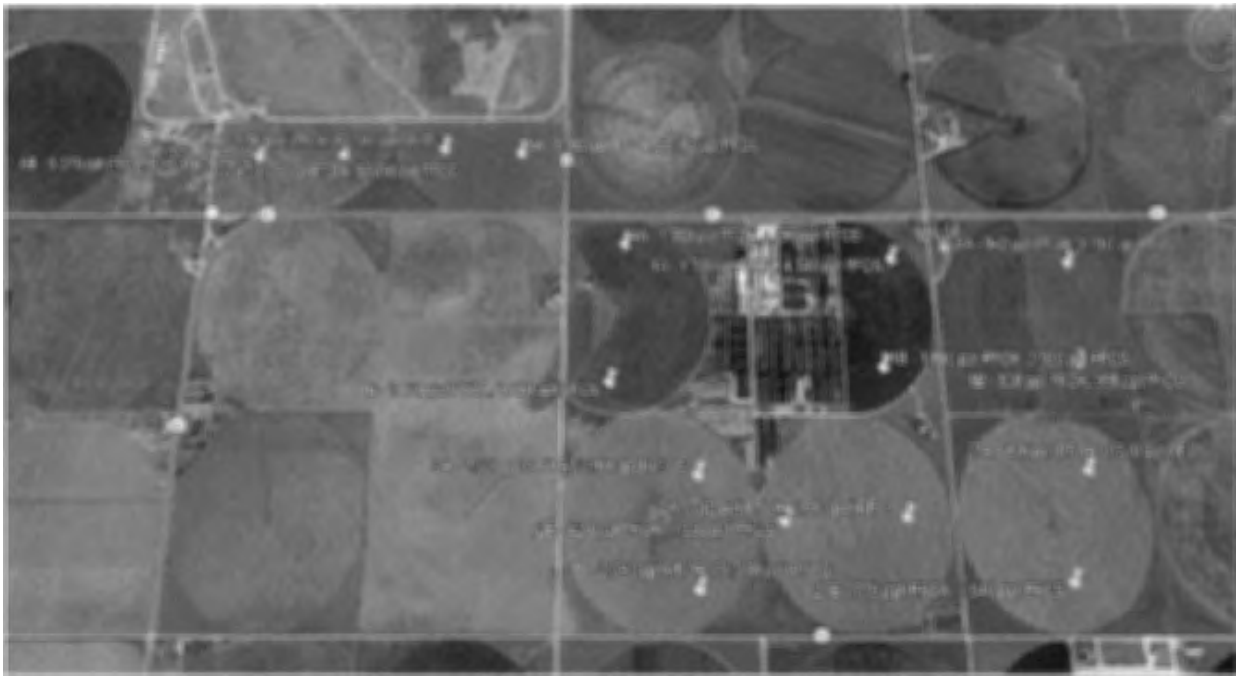


Figure 11: *Highland Dairy Soil Contamination measured in parts per trillion for both PFOA and PFAS (Disposal Trenches outlined in red ink.)*

These soil measurements taken by reputable laboratory SGS confirm that the soil within 400 feet of the Disposal Trenches measures 1,890 ppt for PFOA and 9,090 ppt for PFOS – a total PFAS score in excess of 11,000 ppt. These

9. Permanent Removal Options from April 19, 2022, Forward

Note: This section of the application is the "Removal Plan" for purposes of 40 CFR 760.12(a)(3) and is subject to approval by NMED.

The remaining heard of cattle has been rapidly declining in health with, approximately 10 cattle dying of natural causes daily. On April 20, 2022, the New Mexico State Veterinarian Dr. Ralph Zimmerman approved the immediate depopulation of the remaining 514 head of cattle to alleviate further suffering of the animals. This was reported to the USDA Farm Service Agency in Washington D.C. These cattle were moved to Disposal Trench 2(C) to be covered with organic material for composting.

On May 4, 2022, NMED Contractor Wood Environmental and New Mexico State Veterinarian Dr. Kregg Evetts conducted sampling of the recently euthanized cattle carcasses at Highland Dairy in Disposal Trench 2(C). The cattle had already begun to rapidly decompose. Samples were taken from the approximate center of the trench, which was 30-feet in diameter and remained uncovered for sample access. Necropsy of the cows was not feasible, as their tissues, organs, blood, etc. were already discharged from their bodies and liquifying. Samples of the liquified material were taken along with, bone, tissue, and some muscle that was at the surface that was not saturated by the liquified mixture. In addition, soil samples were collected of the cover materials being used and sidewall samples from the trench.

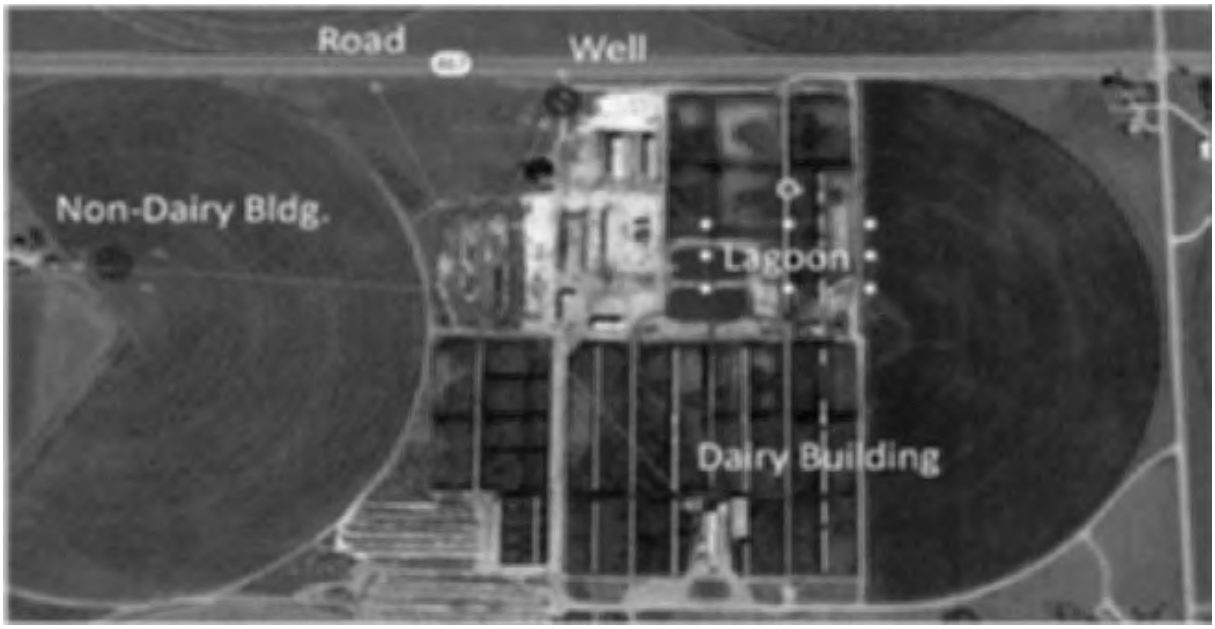
This Removal Plan applies to all PFAS-impacted cow carcasses on Highland Dairy's property, including those fully or partially composted or buried as of the date of the application. Highland Dairy is moving the remnants of the 268 previously composted carcasses from the historic disposal site to Disposal Trench 2(C) as indicated in above in this application. This is being done so that all of the composting takes place in one location and the newer animal carcasses receive the necessary enzymes to facilitate effective composting, from those animals already largely composted. Once the composted carcasses have been removed from the historic disposal site, additional soil sampling of the trench and immediate area will be conducted for PFAS with full lab analyses reported to NMED.

Phase 1: Highland Dairy will compost for a minimum period of six months in accordance with the Natural Resources Conservation Service Standard for Emergency Animal Mortality Management (Code 368 (368-CPS-1).

A final decision on the removal of composted material will come in approximately six months from the time of initial composting in order to allow the animals to decompose and compost. The Applicant anticipates that the animal carcass moisture content should be reduced to less than 20% (substantially decomposed from 1,550 lbs to 310 lbs for each head of adult cattle) and this figure has been utilized for purposes of establishing costs associated with a cremation model, with PFAS testing performed on the remaining 'dry' carcass matter, aka composted material, at the start of Phase 2. Sampling will be performed in accordance with U.S. Environmental Protection Agency SW-846 Test Method 1311: Toxicity Characteristic Leaching Procedure (TCLP) for Resource Conservation and Recovery Act (RCRA) testing. In addition to the composted material, representative samples will be obtained from all disposal trenches and submitted for analyses to determine PFAS concentrations. (Accordingly, the Applicant is not pegging the proficiency of the testing to a particular moisture content in the carcasses.)

Mortalities are to be composted in the most easterly trench of the three available within Disposal Trench 2(C), which is centrally positioned on the Western edge of the dairy facility (see Figure 3 above). This is

the same location where the animals are being composted presently, and the animals would remain in their current location(s) and be covered with a layer of organic "earthfill" material and fenced off from other dairy operations. The following satellite image (Figure 15) shows the distances and stand-off measurements of various features in Curry County:



Water Depth below surface:	250 ft	Closest Water Well:	600 ft (NE)
Second Closest Water Well:	1,330 ft (W)	3rd Closest Water Well:	1,580 ft (E)
Closest Road:	700 ft (N)	Closest Shed:	320 ft (E)
Closest Dairy Building:	1,330 ft (SE)	Closest Non-Dairy Building:	1,660 ft (W)
Closest Clean Water Source:	33,600 ft (NE)	Closest Dairy Lagoon:	670 ft (E)
Closest Brown Water site:	9,550 ft (NW)	Closest residential n'borhood:	9,165 ft (E)
Utilities:	10,000 ft (NW)		

Figure 15: *Distances from Disposal Trenches to Habitability Features*

The Applicant states that there are two features – that are closest to the composting site – situated on the Cannon Air Force Base property. These include the nearest brown water site (the Northern Playa on the base) and the utilities situated in service to the Air Force Base. The region is otherwise remote and there is no water source closer than a lake in the City of Clovis, some 5 miles distant.

Further justification for the composting location currently used consists of the following points:

1. The existing composting site exists with *caliche* clay bottoms offering limited permeability;
2. The composting site forms the epicenter of the PFOS/PFOA concentration on the Highland Dairy site. Independent soil testing recently performed adjacent to the Storage Trenches established the existing presence of PFAS proximate to this location.[1] Therefore, composting in this area does not introduce PFAS to land areas not already impacted by PFAS;
3. The composting site forms a natural containment for the mortalities;

[1] See Figure 11 above. Soil testing performed by SGS on behalf of the Applicant in November 2020 in the crop circle immediately to the West of Disposal Trench 2 on Highland Dairy in November 2020 revealed that the two most regulated PFAS compound levels (PFOA + PFOS) totaled 11,170 parts per trillion (ppt) in the soils less than 360' from Disposal Trench 2(C).

4. The composting site is positioned in a significant distance from the dairy barn wells on the Highland Dairy site;
5. The area is suitable for mortality management in accordance with NRCS standard 368;
6. Any potential runoff from the disposal or storage areas would be managed in accordance with NRCS standard 368 and Highland Dairy's Groundwater Discharge Permit; and,
7. The close proximity to the pens where the mortalities have occurred.

All composting would be centralized in Disposal Trench 2(C) – the most easterly burial trench. Among the remaining cattle on Highland Dairy as of April 19, 2022, there were 617 adult cows– none of which were lactating.[2]

The current composting program (prior to Phase 1) is being conducted by placing the mortalities adjacent to previous mortalities in the open air, or are positioned with a narrow layer of manure and other organic material (3 feet compressed to 2 feet) layered in between year-old carcasses and newer dead carcasses to allow for maximum moisture uptake.

Finally, as a condition of the requested approvals, the Applicant further states the following information is true and accurate to the best of their knowledge. Further, the Applicant commits to undertaking the following actions regarding the composting location Trench 2(C):

- There are no known power lines, utilities, gas lines, water lines or other subterranean infrastructure issues in the vicinity of the composting site. There are no known drainage tiles (subsurface drains) within the operational area of the current and proposed composting site. The Applicant will be responsible for addressing any such issues that may present themselves.
- The Applicant shall be responsible for addressing biosecurity concerns related to the planning, installation, operation, and maintenance of a catastrophic animal mortality operation, including pursuant to NRCS Conservation Practice Standard - Code 368.
- There are no public water supply or surface intake structures within 1,000 feet of the boundaries of the current and proposed composting site.
- There are no residential or public buildings within 400 feet of the current and proposed composting site.
- There are no surface waters of the State or drainage inlets (including water and sediment control basins) within 100 feet of the current and proposed composting site.
- There are no known sinkholes (measured from the superficial opening or lowest point within 100 feet of the current and proposed composting site.
- There are no water wells (onsite or otherwise) within 100 feet of the current and proposed composting site.
- There are no property lines or public roads within 100 feet of the current and proposed composting site.
- The operations are situated above the 100-year floodplain elevation.
- The mortality management operations are designed to minimize disruption of ongoing daily operations of the dairy facility.
- The mortality management operations will not interfere with ingress and egress or other travel patterns on the farm such as livestock pathways and feed lanes.
- The Applicant retained professional services to conduct soil sampling to determine the suitability of the

[2] There are other younger animals on the dairy that were not introduced to water containing PFAS. These include open and bred heifers and calves. These animals were birthed after the introduction of the RK water filtration system in early 2020 and up to approximately March of 2021. Those after-born animals are not to be depopulated or disposed of pursuant to this Removal Plan.

composting site. The site is not configured with any percolation field and there is a minimum of two feet between the bottom of the composting site and the seasonal high-water table. Additionally, the site is not resting upon a structure of hard bedrock, bedrock crevices, or highly permeable strata at or directly below the bottom of the composting site.

- The bottoms of the existing Trenches are constructed as relatively level. In the event that additional composting locations (other than Section 2(C)) are required, said areas are separated by more than three feet of undisturbed soil.
- The Applicant will utilize USDA Field Operations Technical Guide (FOTG) Standards for Critical Area Planting to revegetate all areas disturbed by the mortality management activities.
- The Applicant must comply with all local (Curry County), state and federal laws and regulations.
- The Applicant has retained topsoil from the proposed composting site in order to regrade the composting site after the ground as settled as the decay process is completed.
- The composting site will be fenced to protect the safety of humans and animals from injury. Barriers at a minimum of 20 feet from the edge of the composting site shall be put in place to prevent vehicles and wild or domestic wildlife from disturbing the mortality location.
- The composting site will be marked with warning signs and weekly visual assessments will be conducted. Records shall be maintained for ready reference for managers, employees, visitors, utility workers, well drilling contractors, and others who may come into contact with the composting site.
- The Applicant will develop an Operation & Maintenance (O&M) Plan to include, at a minimum:
  - Specific instructions for the proper operation and maintenance of the composting site, detailing the level of inspection and repairs needed to optimize composting conditions and maintain the effectiveness and useful life of the compost system;
  - Safety considerations;
  - Biosecurity concerns in all aspects of the installation, operation and maintenance;
  - Contact details and phone numbers for persons to contact in the event of a catastrophic event;
  - Programs for recordkeeping of the mortality management operation including the methods and procedures applied to the practice;
  - Periodic inspections of the composting sites as appropriate and noted above; and,
  - Prompt repair or replacement of damaged components as appropriate.

After six months of composting pursuant to the NRCS standard and the provisions of this Removal Plan, if additional time is needed to complete composting before advancing to the removal steps outlined below, Highland Dairy will re-test the sites in three-month intervals until NMED, in coordination with Highland Dairy and the New Mexico Department of Agriculture, decides to advance to Phase 2.

Phase 2: After composting is complete, Highland Dairy will conduct sampling of impacted material (e.g., material generated during the composting process and associated soil, liners, etc.).

2.1 If **positive** for PFOS or PFOA, meaning above the NMED Resource Conservation and Recovery Act (RCRA) Risk Assessment Guidance[3] screening level of greater than or equal to 26 mg/kg for PFOS and PFOA in industrial/occupational soil, Applicant will provide a detailed hazardous substance disposal plan[4] with technical justification for one of these options for NMED review

[3] NMED Risk Assessment Guidance for Site Investigations and Remediation, Volume I, Soil Screening Guidance for Human Health Risk Assessments, available at https://www.env.nm.gov/hazardous-waste/wp-content/uploads/sites/10/2021/12/NMED_SSG-VOL_I_Dec_2_2021.pdf.

[4] The Applicant would object to any characterization that Highland Dairy is responsible for the generation of hazardous substances by the actions taken in advance of or to be taken pursuant to this Application. The Applicant has already

and approval:

2.1.1 Remove impacted material to a RCRA Subtitle C (Hazardous Waste) disposal facility;

2.1.2 Cremation with mobile on-site crematory equipment; or,

2.1.3 Demonstrate to NMED that an alternative management and disposal method is equivalent to or more stringent than 2.1.1 or 2.1.2.

In the event the impacted material is removed from the site or incinerated on site, conduct confirmatory sampling of soils utilized in the composting area and any other locations from which material is removed.

2.2 If **negative** for PFOS or PFOA, meaning below the NMED RCRA Risk Assessment Guidance screening level of less than 26 mg/kg, Applicant will provide a disposal plan with technical justification for one of these options for NMED review and approval:

2.2.1 Permanent disposal on-site;

2.2.2 Removal to conventional landfill; or

2.2.3 Demonstrate to NMED that an alternative management and disposal method is equivalent to or more stringent than 2.2.1 or 2.2.2.

Based on results of representative sampling and analysis, full implementation of Phase 2 may involve a combination of 2.1 and 2.2 options if material from some areas of the composting site is above the screening level and material from other areas is below the screening level. The following detail is provided as to each of the foregoing possible removal options considered during implementation of Phase 2.

ACTIONS TO BE TAKEN IF TESTING REVEALS THAT THE IMPACTED MATERIAL IS HAZARDOUS:

Option 2.1.1: Remove impacted material to a RCRA Subtitle C licensed hazardous waste disposal facility

At the time of this DIPP application, the Applicant has been unable to identify a RCRA Subtitle C hazardous waste disposal facility that is willing and able to accept the PFAS-contaminated composted material and associated impacted materials.

If and when Option 2.1.1 is selected for implementation pursuant to other provisions of this Removal Plan, state funding via NMED's Hazardous Waste Emergency Fund (subject to available funding) and federal funding via the NRCS EQIP program may be available to Highland Dairy to provide some relief for the costs associated with the ultimate disposition of all PFAS-contaminated material in accordance with all applicable hazardous waste and/or hazardous substance disposal requirements.

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sought relief through a Federal Tort Claims Act claim against the United States of America and launched litigation against the USA as well as filed suit against multiple chemical companies responsible for the distribution of the AFFF compounds which the US Air Force utilized at Cannon Air Force Base. The responsibility for the PFAS contamination stream discussed here lies with these parties and not the Applicant.

After removal, the Applicant will conduct confirmatory PFAS sampling of soils utilized in composting area and any other locations from which material is removed and coordinate with NMED on next steps to comply with state requirements and protect public health.

Option 2.1.2: Cremation with Mobile On-Site Crematory equipment

Implementation of this option is only allowed with NMED approval after the completion of Phase 1 of the Removal Plan and subsequent legal and technical review, including full review of the PFAS sampling results and the best available science and specifications related to fate and transport of PFAS through incineration.

The animal carcasses, reduced by weight through the composting process in Phase 1, would, in this scenario, be cremated on the Highland Dairy property. Because of the high residency temperatures involved in the cremation process (up to 1,300° F), this method of disposal may result in ash that has low to non-detect levels of PFAS. The heat and residency formula for cremation are designed to break-down the long-chain carbon compounds. Ash with PFAS levels less than the RCRA screening level could remain on the Highland Dairy property or be transported to a conventional solid waste landfill (i.e., regulated under RCRA Subtitle D (Municipal Solid Waste)). If NMED approves this option, Highland Diary will coordinate closely with NMED on each step, including reviewing specifications for candidate on-site incineration companies, preparing necessary regulatory reviews and permitting processes, if required, for air emissions, and preparing proper sampling and contingency plans to be implemented during and after the cremation process.

As one example, Highland Dairy has proposed contracting with Clean Harbors Inc. (CHI) under this scenario, and CHI would deliver a mobile crematorium with capacity to cremate the remains of 102 animal carcasses per 14-hour day. During Phase 1 (composting), NMED will conduct further research and review of relevant technology testing, PFAS disposal research and other studies to understand the best available science associated with incineration of PFAS-contaminated hazardous waste.

After removal, the Applicant will conduct confirmatory PFAS sampling of soils utilized in composting area and any other locations from which material is removed and coordinate with NMED on next steps to comply with state requirements and protect public health.

Option 2.1.3: Demonstrate to NMED that an alternative management and disposal method is equivalent to or more stringent than 2.1.1 or 2.1.2.

The Removal Plan does include description of this option, as it is subject to future development and proposal by Highland Dairy to NMED.

ACTIONS TO BE TAKEN IF TESTING REVEALS THAT THE IMPACTED MATERIAL IS NOT HAZARDOUS:

Option 2.2.1: Permanent Disposal of Impacted Materials On-site

In the event that PFOA and/or PFOS levels in the composted material are below the screening level established by the NMED RCRA Risk Assessment Guidance, the Applicant may complete the task of permanently disposing of the composted material onsite.

At present, the NRCS has prohibited the burial of the PFAS contaminated carcass materials. However, this application and this Option (2.2.1) presumes that the composted material will test for PFAS at levels below the RCRA screening level. (Under separate instrument, the Applicant is appealing the February 2022 decision of the NRCS to disallow burial of the animals in their indeterminate state.)

Applicant notes that prior to this application and approval of the Removal Plan, the carcasses were left exposed to the elements (including the oxygen in the atmosphere) in order to accelerate the decomposition of the animal carcasses.

The move to permanent burial of the composted material would involve the introduction of a 'cap' that had not been implemented previously to the process, including during Phase 1. This will require securing a substantial amount of mixed clay, sand, manure, feed, feed scrape and other organic material to create a 2-to-3-foot layer of material on the top of the finished compost so that the composted material is encased.

This is sometimes referred to as involving the placement of "earthfill" material on top of the tomb of composted material, as presented in Figure 14 below:

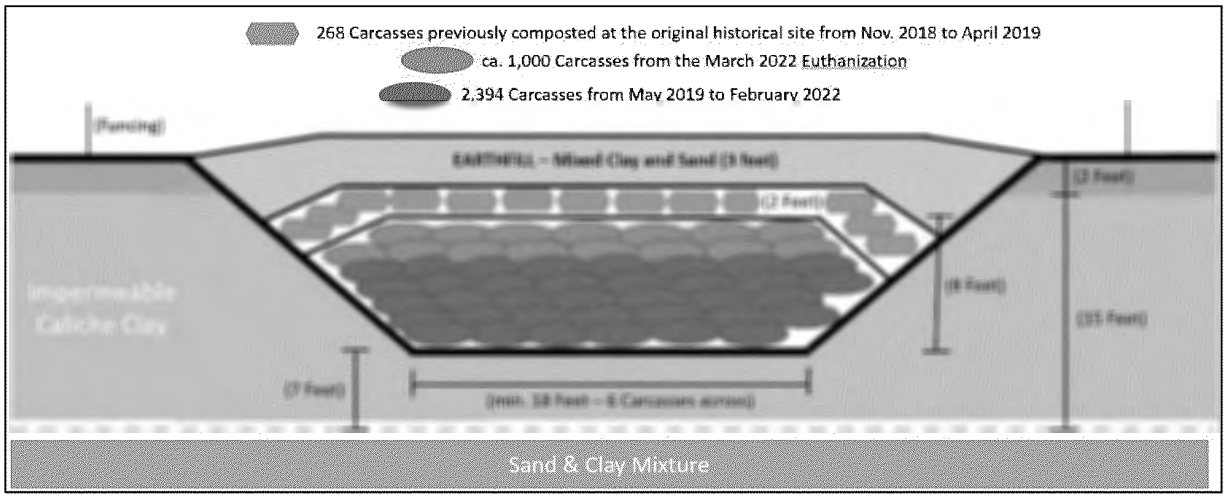


Figure 14: *Permanent Burial of Composted Material*

Option 2.2.2: Removal to Conventional Landfill

Any impacted material that is not hazardous based on results of PFAS analysis during Phase 2 may be transferred to a conventional solid waste landfill such as the Clovis Landfill, should they choose to accept the waste. Before implementing this option, Highland Dairy will consult directly with NMED's Solid Waste Bureau to ensure all requirements are met by the Dairy and the receiving landfill.

After removal, the Applicant will conduct confirmatory PFAS sampling of soils utilized in composting area and any other locations from which material is removed and coordinate with NMED on next steps to comply with state requirements and protect public health.

Option 2.2.3: Demonstrate to NMED that an alternative management and disposal method is equivalent to or more stringent than 2.2.1 or 2.2.2.

The Removal Plan does include description of this option, as it is subject to future development and proposal by Highland Dairy to NMED.

Removal Plan Conclusion

This Removal Plan is consistent with applicable federal and state law as of the date of approval. In addition, the Removal Plan furthers the public policy objectives of protecting public health through proper management of PFAS contamination. Highland Dairy agrees to work in close coordination with NMED throughout implementation of this Removal Plan. At any point during implementation, NMED may seek agreement from Highland Dairy to enter into a legally binding consent order that will reflect the provisions of the Removal Plan and support the prompt gathering of new data and deliberate regulatory decision-making throughout the process.

Exhibit 14

Rutten Kern
Policy Group

641 Constitution Avenue, N.E.
Washington, DC 20002
(202) 251-5477
www.ruttenkern.com

518 Old Santa Fe Trail, # 600
Santa Fe, NM 87505
(505) 316-4066
tmr or jbk@ruttenkern.com

12 May 2022
Santa Fe

Bruce Baizel, Esq.
General Counsel

Chris Catechis
Acting Director, Resource Protection Division
New Mexico Environment Department
Harold Runnels Building, Ste 4050
1190 St. Francis Drive
Santa Fe, New Mexico 87502

Re: Application for Funding from the New Mexico Hazardous Waste Emergency Fund for Art and Renee Schaap, d/b/a Highland Dairy (Curry County, New Mexico)

Dear Mr. Baizel:

Highland Dairy hereby applies for $1,648,253.35 in hazardous waste cleanup and disposal funding from the New Mexico Hazardous Waste Emergency Fund.

This application is presented at a moment in time when the dairy has committed thousands of man-hours, millions in feed costs, and more than 2,000 tons of composting material to the initial process of composting in order to prepare for the eventual removal of hazardous PFAS substances from 3,665 adult dairy cow carcasses from the dairy property adjacent to the Cannon Air Force Base. Pursuant to the application for depopulation and removal, we have begun this process as a necessary precursor for the permanent removal of these hazardous substances. The carcasses are the remains from animals condemned as "adulterated" by the USDA Food Safety & Inspection Service, the US Food and Drug Administration (FDA) and the New Mexico Department of Agriculture (NMDA). This application is presented with a review of the contamination present on the dairy (water, soil, silage, and livestock) and incorporates the costs of establishing the Disposal Trench ($306,212.40), Depopulation of the Herd ($77,120.00), and the actual composting of the herd reflecting the gradual processing of the animals as they have died over the prior 45 months and the April 2022 composting project ($1,264,920.95).

As your office is aware, we are seeking funding from the USDA Farm Service Agency's newly enacted Dairy Indemnity Payment Program (DIPP) for a 'cow buy-out" relative to the value of the dairy herd that has been lost. In support of that application, we prepared a "DIPP Application Narrative" and an updated and finalized version of that item was submitted to the NMED on April 25, 2022. We

understand that the Secretary is prepared to sign-off on the application this week. Dr. Zimmerman, the State Veterinarian, signed the document on April 21st and authorized the depopulation plan with a site visit the day prior. I am not enclosing a copy of that Narrative at this time because we believe there may have been edits incorporated by the Department since our last submission. Once finalized, I will forward the same to your attention.

This application is for a separate measure of relief – the costs associated with establishing compost facilities, the depopulation of the remaining members of the herd, and the composting activities themselves. We have not depopulated the entire adult cow herd and there are no more living cows on the dairy.

The depopulation and the composting project undertaken here is the initial stage in the disposal and removal of the animals. This application (and the DIPP Application Narrative) refers to but do not seek remuneration for the ultimate disposition of the animals or their carcasses. We intend to apply to the USDA NRCS for relief for those eventual steps through the EQIP program made available to farmers such as Mr. and Mrs. Schaap, the general partners in Highland Dairy.

New Mexico as a Leader in Environmental Law and Policy

In January 2019, following Cannon Air Force Base's public disclosure of its long-known presence of PFAS compounds in drinking water supplies on and adjacent to the Curry County base, NMED's Secretary James Kenney invoked an interpretation of RCRA demanding that the U.S. Air Force recognize PFAS compounds as subject to the Resource Conservation Recovery Act (RCRA), and as we have seen, that issue has been the subject of intensive litigation for three years now.

In June 2021, Governor Michelle Lujan Grisham took formal steps to request that the EPA characterize PFAS compounds as a class of chemicals within Subpart C of RCRA, or alternatively, list individual PFAS chemicals under RCRA since these compounds are truly, "hazardous substances". As Governor Lujan Grisham stated, PFAS compounds *"present an imminent and substantial endangerment to human health and the environment"*. The application further stated, *"In October 2018, a Curry County, New Mexico dairy farmer that borders Cannon Air Force Base learned his water was contaminated with PFAS. The milk was tested and the New Mexico Department of Agriculture worked with the U.S. Food and Drug Administration (FDA) to risk warning levels for PFAS in milk. The milk was immediately pulled off the market. Since then, the dairy farmer has had to destroy tens of millions of gallons of milk, losing millions of dollars in revenue that otherwise would have recirculated in our state and national economy. This economic impact is in addition to the as yet unknown health impact the dairy farmer and his family may endure because of the DOD's PFAS contamination of the water. New Mexico's agricultural reputation is essential to both the nation's milk supply and our state economy."*

We appreciate that in 1976, when Congress adopted the RCRA, it declared a national policy, "that, wherever feasible, the generation of hazardous wastes is to be reduced or eliminated as expeditiously as possible. Waste that is nevertheless generated should be treated, stored, or disposed of so as to minimize the present and future threat to human health and the environment."

As EPA Administrator Michael S. Regan announced plans to implement rulemaking responding to Gov. Lujan Grisham's request, he stated on October 26, 2021, "[t]oday, we are taking important steps toward developing new scientific approaches to confront these dangerous chemicals and strengthening the

ability to clean up PFAS contamination. I thank Governor Lujan Grisham for her engagement and leadership, which will lead to better protections for people in New Mexico and across the country."

New Mexico Hazardous Waste Emergency Fund

We consider that Chapter 74, Article 4 on Hazardous Wastes should incorporate the costs of private citizens in the cleanup and disposal of PFAS substances from the terrain of New Mexico – when those contaminants are not introduced by such private party - and qualify for coverage under the state's Emergency Fund. New Mexico Stat § 74-4-8 (2020), provides:

> *The "hazardous waste emergency fund" is created in the state treasury. This fund shall be used for cleanup of hazardous substance incidents, disposal of hazardous substances and necessary repairs to or replacement of state property and may be used for the state's share of any response action taken under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. Sections 9601 et seq. The administrative and technical expenses of maintaining an emergency response program within the division shall be reimbursable on a quarterly basis from this fund. Any penalties collected by the division shall be credited to this fund. Amounts in the fund shall be deposited with the state treasurer and then disbursed pursuant to vouchers signed by the director or his authorized representative upon warrants drawn by the secretary of finance and administration.*

Accordingly, we request that the Director (the Secretary or his authorized representative) execute a voucher authorizing the State Treasurer to issue proceeds drawn by the Secretary of Finance and Administration for the hazardous waste clean-up activities related to the proper treatment of the adulterated dairy herd described herein. We are relying on formulae that are published by the NRCS, and our actual costs associated with cattle composting to date, which together total $1.648 million.

We note that Mr. Schaap agreed to have the Department's contractor to come to the dairy on or about May 5th and take random tissue samples from some deceased carcasses. I note that Mr. Schaap had identified five surviving cows from NMDA's testing program from 2019 and 2020, but we were advised that testing of those particular animals would not be needed; they were put down. We don't believe that on May 5th there was any way to determine the provenance of the animals tested. They could have been born on the dairy as early as 2016 to as late as 2020. We also note that the deceased animals entered the compost trench with a moisture level of some 85% and that the blood, organs and tissue of the herd are essentially homogenized into the area. There is an "ooze factor" at the present time in Disposal Trench 2(C) that caused our front-end loaders and graders to repeatedly become stuck in the soup that became Disposal Trench 2(C). Therefore, we don't really believe that test results from May 5th will be indicative of the PFAS compounds present in the liquefaction of dairy cow carcasses.

We therefore would encourage NMED to disregard the current round of test results and examine the tissue at the conclusion of the 'drying-out' process which has been forecast to take 6 months.

As described in the "DIPP Application Narrative", the long-term disposition of the animal carcasses with waste registering as PFAS positive ("hazardous waste") is to be either by cremation or removal, and if eventually the animal carcasses test negative for PFAS, "shallow burial of hooved animals". These disposition alternatives are separate and apart from the composting of the animals which is a required first step in the PFAS cleanup and disposal process. We assert that at this time 100% of the animals that

have died and are going to die have been condemned as PFAS-adulterated and should fall within the parameters of eligibility for cleanup and disposal.

Moreover, the applicant will seek EQIP funding from the USDA NRCS for whichever of these options, or a combination of these options, is the long-term resolution practice agreed upon with the NMED and the NRCS at a later time. Accordingly, the applicant is not 'double dipping'; with this request for financial assistance relative to the interim step of composting the animal carcasses and remains.

The following is the premise of this request for a grant, and the circumstances which have brought the owners of Highland Dairy to their knees, financially and otherwise:

The Need for Cleanup of PFAS Hazardous Waste

As a direct result of the US Air Force's use of AFFF materials at Cannon Air Force Base, neighboring Highland Dairy received measurable contamination from the spread of PFOS and PFOA, among other PFAS compounds, throughout its dairy and farm operations. The compounds were transmitted through well water drawn from the Ogallala Aquifer pursuant to the water rights held by Highland Dairy and its owners Art and Renee Schaap.

PFAS contamination has included:

Agricultural Water:

- PFOS and PFOA measured in excess of 37,700 parts per trillion, well in excess of the 70 ppt standard for agricultural water established by Congress in the 2020 NDAA (National Defense Authorization Act, § 343) as imputed values from the EPA's Lifetime Health Advisory originally set by the Biden administration in 2016;

- This water was employed in irrigating crops and fields since at least 1992. This unfiltered water was delivered to the Highland Dairy herd until March 2020 when a PFAS water filtration system was installed by the owners at their own expense.

- In spite of the presence of the federal requirement embodied in the 2020 NDAA (§ 343) requirement for agricultural water to be treated on an equal basis with human drinking water, to date the US Air Force has refused to take any action related to purification and but for the applicant's mitigation efforts, the water remains contaminated.

Dairy Milk:

- PFOS and PFOA test results greater than 5,000 parts per trillion in the milk produced by the Highland Dairy herd. Please refer to Figure 2 in the forthcoming DIPP Application Narrative.

- The FDA has never published a standard on PFAS milk contamination but has 'suggested' that an appropriate standard would be 200 ppt for PFOA and PFOS, again drawing on a standard derived relative to the diets of children and the Lifetime Health Advisory of the FDA for drinking water. The lowest figure on hand for the Highland Dairy herd was approximately 900 ppt.

- As a result of the positive PFAS tests on milk supplies, Highland Dairy lost its Grade A Milk Permit in November 2018.

- The dairy was eligible for 37 months for milk payment support from the USDA; this expired in December 2020. The dairy finished milking the lactating cows in early 2021 and dried them off so currently there is no further milk production. During that time the contaminated milk was dumped into dairy lagoons on the dairy.

Soils at Highland Dairy Farms:

- The owners secured testing of 16 sites from the top 6" of soils on Highland Dairy and its neighboring farm acreage in November 2020. These tests determined that PFOA was detected in the soils ranging from 1,836 ug/kg (or ppt) to 90,260 ug/kg, with an overall average from irrigation resulting in 22,486 ug/kg. Please refer to Figure 10 in the forthcoming DIPP Application Narrative and the actual data referenced in the chart adjacent to this paragraph.

Test	Site	PFOA	PFOS	Total
1	1A	1720	4140	5860
2	1B	1810	3580	5390
3	2A	742	1560	2302
4	2B	620	1330	1950
5	3A	2320	11600	13920
6	3B	2390	11300	13690
7	4A	1980	9090	11070
8	4B	1120	7480	8600
9	5A	8960	58100	67060
10	5B	7760	82500	90260
11	6A	5690	58400	64090
12	6B	5270	61300	66570
13	8A	942	1710	2652
14	8B	838	998	1836
15	27A	896	1310	2206
16	27B	779	1540	2319
	TOTAL	43837	315938	359775
	Average	2740	19746	22486

- The presence of PFAS in these soils prohibits the application of the lands to food-producing crops, as it is believed that the soils will allow an uptake of the carbons into the crops grown on the subject acreage. See the article entitled *Challenges and Current Status of the Biological Treatment of PFAS-Contaminated Soils* from the Australian journal Frontiers in Bioengineering and Biotechnology, which states, "Current methods to remove PFAS from contaminated soils are expensive, impractical for *in situ* treatment, use high pressure and temperatures, and/or result in toxic waste. Biodegradation has the potential to form the basis of a cost-effective, large scale *in situ* remediation strategy for PFAS. However, information about the biodegradation of PFAS by fungal and bacteria is limited."

- As of the present time, there is no EPA standard on PFAS contamination in soils and no preferred methods of treating soil, other than what the applicant has seen undertaken by Clean Harbors Inc. with the prospect of a removal of the contaminated soils (i.e. the top 4" of soil) and placement of the same in a hazardous waste storage facility.

Silage Grown at Highland Dairy Farms:

- The New Mexico Department of Agriculture conducted tests on the silage drawn from several fields on the Highland Dairy farms in May, September, and October 2020.

- These results showed that PFOS was detected in the samples measuring at 873 ppt in May 2020, 16,910 in September 2020 and 4,275 in October 2020 wheat samples. These results

also showed that PFOA was found to be not detected in the May 2020 samples, measured 435 ppt in the September samples, and measured 860 ppt in the October 2020 wheat samples.

- In spite of the fact that neither the EPA, the USDA, nor the FDA have established testing standards for the silage grown on fields in the United States, these were deemed irrevocably high as food applied to adulterated animals when trying to lower their blood plasma (and muscle) scores to an acceptable level for human consumption.

Livestock on Highland Dairy:

- The detection of PFAS contaminants led to the quarantining of the entire Highland Dairy herd in late 2018. More than 4,000 Holstein and Cross Jersey cows have been "stranded" on the dairy and more than 2,500 have died in the feedlots and dairy facilities, having no economic value and being confined to the dairy property. One-by-one they have suffered deaths and been placed in compost. In round numbers, the first 500 were placed in an above-ground compost location from November 2018 to April 2019 and since that time, the next 2,000 were placed in a disposal trench prepared for their composting.

- In the meantime, the FSIS blanketed the southwestern United States meat processing industry with news of its prohibition on the purchase and sale of beef from Highland Dairy due to the adulteration of PFAS in those animals. After several attempts to find markets, Highland Dairy realized that there would be no commercially available markets in the United States for these animals if they were to be rehabilitated.

- In March 2019, the USDA FSIS started testing the beef muscle tissue in the Highland Dairy herd, through a culling of some 30 animals, with a plan to correlate blood plasma results to muscle test results. By December 2019, the FSIS issued a protocol for beef sales declaring that if a level of 35.1 ppb could be achieved from blood plasma sampling, that figure would correlate to a measurement of 4.1 ppb in the muscle tissue, which FSIS deemed would be acceptable for the diets of 6-year old children across America. See Figure 1 in the DIPP Application Narrative.

- Blood Serum measurements taken in March 2019 revealed scores at an average of 62.6 ppb. (This correlated to a muscle score in excess of 6.0 ppb.) Some animals tested as high as 130 parts per billion. The second round of tests revealed a blood plasma score of 60.0 one year later in March, 2020 (correlating to 5.5 ppb in the muscle) and a third round of tests revealed a blood plasma score of 66.1 ppb (correlating to 6.2 ppb in the muscle). The applicant cautions that these figures relate to the detection and measuring of just one compound – PFOS – out of the thousands of known PFAS compounds to be included in AFFF firefighting products.

- Finally, in December 2019, the FSIS stated that it would be possible to release the animals to commercial markets if they were to test favorably under this PFOS regime: *"If the average PFOS level in the plasma of the sampled animals from a given lot exceeds 35 parts per billion (ppb), that lot of animals may <u>not</u> proceed to slaughter at that time." …. "If the average PFOS level in the plasma of the animals sampled from a given lot does not exceed 35 ppb,*

USDA will advise NMDA that the lot is cleared to proceed to slaughter." (Emphasis in the original.)

- In reality, the three test sets generated from the Highland Dairy herd realized blood plasma scores of 62.9, 60.0 and 66.1 ppb before the FSIS abandoned its attempt to rehabilitate the dairy cows in September 2020. We believe that the FSIS realized late in the game that Highland Dairy was feeding the animals a mix of silage that included grasses and grains grown on the dairy that had been irrigated with PFAS-laden water and that this was a significant and fatal error to the analysis conducted in a laboratory setting focused solely on water in the diets of these animals. Of course, Highland Dairy could not afford to purchase from third parties unadulterated crops to feed its animals that were already devoid of market value.

- The owners attempted to find a market outside the United States for either beef or dairy cows (i.e. in Mexico, Panama, Belize, etc.), but the New Mexico Department of Agriculture threatened criminal action in the event the animals might be exported, even if the importing country had no protocol or regulatory framework touching on PFAS contamination.

Composition of Financial Requests:

The funding application contained herein is therefore as follows for this interim step in the cleanup and disposal of PFAS contaminants in the livestock quarantined on Highland Dairy in three different respects or categories of funding:

1. Establishment of a Composting Facility ----------

According to the USDA NRCS, "[c]omposting animal mortality is a process that decomposes the dead carcasses from a livestock operation, making them suitable for disposal by land application. [This definition does not take into consideration latent detectable PFAS in animal carcass remnants.] It uses a simple mixture of manure (litter), animal carcasses, and a coarse plant material such as wheat straw, peanut hulls, soybean hulls, etc. Only enough water is added to keep the material moist; the mixture should never be saturated. Composting can be [include] large static piles in the open. Large animals can be composted by using hay bales to contain manure and coarse plant material as long as the site is not near water bodies, wells or homes."[1] The USDA NRCS has published guidance on both establishing facilities and on composting practices. See 2016, Code 317, Conservation Practice Standard (for) Composting Facility) and 2010: Part 637, Environmental Engineering National Engineering Handbook, Chapter 2: Composting, p. 2-61. In the former, guidance is offered in terms of establishing physical siting parameters, practices and monitoring methods. For the latter, the USDA looks largely to state Departments of Agriculture for guidance on Livestock (or "Deadstock" as it is called), and while some information provided is helpful, others are not. For example, the USDA proposes using 16 tons of manure and litter for cover on each deceased animal, above, alongside, and below the carcass. This is not feasible or even remotely cost efficient. At an out-of-pocket cost of $165.00 per ton at today's prices, this would elevate costs for materials to a level in excess of $2,200 for each animal. The federal approach also proposes turning and aerating the carcasses every 60-90 days, which is not practicable in the Highland Dairy case as labor costs would increase ten-fold.

[1] https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1167343.pdf

Accordingly, the applicant has been left to find other resources to help guide the Highland Dairy management team to develop a large-scale composting operation on the dairy. The State of New Mexico's Department of Agriculture has not published guidance on the practice of composting large animal carcasses. Therefore, to the greatest extent possible, the applicant has followed (2) the Emergency Livestock Disposal Planning bulletin developed by Iowa State University's Department of Agricultural & Biosystems Engineering for on-farm mortality composting, (3) Washington State University Extension's bulletin on "On-Farm Composting of Large Animal Mortalities", and (4) the Maine Department of Agriculture, Food and Rural Resources; "Best Management Practices for Animal Carcass Composting 2011", although the latter addresses primarily smaller animal composting. These bulletins provide instruction on managing moisture content, materials to be applied, equipment to be used, organization of the animals in the windrows or piles, the application of organic matter, and providing for aeration of the compost mixture, particularly for catastrophic mortalities such as that incurred by Highland Dairy. Iowa State's guidance has been adopted by Washington State, and Washington state's guidance has been adopted by Indiana's Department of Agriculture and other states as well.

Washington State's Department of Ecology defines Composting as, "[t]he biological decomposition and stabilization of organic matter under mostly aerobic conditions of high temperature (120°F or higher). When oxygen, moisture, nitrogen and carbon are available in the right proportions, the degradation generates considerable quantities of heat, reaching temperatures of 130° to 170° F. This sustained high temperature is responsible for the virtually complete destruction of pathogenic organisms and weed seeds in the composted material. The process also results in a humus-like product that has its nutrients in a much more stable form than the uncomposted wastes making it safer and easier to store and use."

Highland's composting facility is situated in a caliche clay-lined trench measuring approximately 12' below the natural grade of the dairy property. These were formerly borrow-pits from which soils above the caliche clay were harvested to even out other dips in the grade of the terrain on the dairy property. The elements of the Disposal Trenches are discussed further in the DIPP Application Narrative.

The Disposal Trenches dedicated to composting of the animal carcasses at Highland Dairy fit within the composting facility criteria of these state authorities as well as the USDA NRCS. (See DIPP Application Narrative.)

The USDA has established a value of $20.69 per sq. ft. of land dedicated to large animal composting facilities.

Request # 1: Composting Facility- Disposal Trench 2(C):

As referenced in Sections 5 & 6 of the attached "DIPP Application Narrative" being submitted to the USDA Farm Service Agency, Highland Dairy established "Disposal Trench 2(C)" measuring 74' x 200' (and 12' deep) on its premises and designated this portion of the dairy property as a composting area for the placement of animals beginning in April 2019. Disposal Trench 2(C) has been the repository of a total of **3,665** animals that have been situated in an in-house composting manner and allowed to decompose through the composting process.

Request: 74 x 200 = 14,800 sq. ft. @ $20.69: $306,212.40

2. Depopulation Exercise ----------

Highland Dairy 'depopulated' 514 animals pursuant to DIPP Application No. 0002. Highland also mobilized for preliminary depopulation exercised in December 2021 (98 head pursuant to DIPP Application No. 0001) and again on April 15, 2022 (290 head) and another 62 head on April 20, 2022 out of humanitarian concern for the welfare of the animals (pursuant to DIPP Application No. 0003) and in order to humanely resolve the lingering lives of the compromised, adultered animals. As referenced in Section 4 of the DIPP Application Narrative, the animals were killed using a captive bolt technology or a .22 gauge bullet, and then prepared the animals for transportation to Disposal Trench 2(C). We request $80 per animal for this exercise.

Request: 964 head @ $80.00 per head: $77,120.00

3. Composting of Deceased Cow Carcasses ----------

In May 2020, the USDA Natural Resource Conservation Service's Environmental Quality Incentives Program (EQIP) established a reimbursement rate for the composting of deceased livestock at $76.88 per 1,000 lb "Animal Unit" (AU) when these animals are composted "in-house" – that is on the premises of the farmer – and the farmer is not a member of a historically underserved farmer population. See the attached May 2020 Emergency Animal Mortality Management Schedule found at this LINK, the NRCS EQIP publication referencing this amount. The applicant notes that the EQIP schedule provides a footnote which reflects that the "Costs of materials, equipment, and mobilization are highly variable. Actual costs may be significantly different from payment rates."

The applicant has incurred 3,665 adult cow deaths on the dairy while these animals were under quarantine. This figure corresponds to the DIPP Applications numbered 0001, 0002, and 0003 pursuant to FSA Form 373-B (issued April 1, 2022) as follows:

DIPP Application 001:		
2018 (Nov. 1 – Dec. 31)	68	
2019	505	
2020	522	
2021	1,187	
2022 (Jan. 1 – April 10)	477	
DIPP Application 002:		
2022 (Apr. 21 – 25)	514	
DIPP Application 003:		
2022 (April 11 – 20)	392	
Total:		3,665

Composting Weights:

(a) 268 Animals that were composted at the historic disposal site and had their average weight reduced through composting by 80%:

268 @ (1,550 * .2) =	83,080 lbs
Animal Units: (1,000 lbs)	83.08 AU
(b) 3,397 @ 1,550 lbs =	5,265,350 lbs
Animal Units: (1,000 lbs)	5,265.35 AU
Total AU:	5,348.43 AU

The applicant states that the $76.88 figure incorporated into the Emergency Animal Mortality Management Schedule (which if multiplied by 5,348.43 AU would yield $411,187.30) is unreasonably low considering that the actual costs associated with composting deceased animals are considerably higher:

Elements for Composting 3,450.6 Adult Animals[2] at Highland Dairy:	**Amount:**	
Materials:		
Pushout Feed per animal (8 yards or 4.8 tons) @ $165.00 per ton discounted by 80%	$158.40	
Manure for each animal (500 lbs) @ $40.00 per ton	$ 10.00	
Monthly Water Applications (electrical charge and Equipment maintenance, hosing, etc.)	$ 0.85	
Top-layer of Manure over the entire Trench (500 tons)	$ 30.08	
Fencing Material to surround Disposal Trench 2(C)	$ 1.00	
Subtotal per Animal:		$200.33
Equipment:		
a. 45 Months of Operations:		
John Deere Front End Loader: Used daily for 50% of the operation of the loader, $3,000 per month / 62.5 head per month over the past 45 months:	$ 24.00	
Loader Fuel: $4.59 per gallon, 1.5 gallons per animal	$ 6.89	
Insurance: $300 per month / 62.5 head per month over the past 45 months:	$ 2.40	
Caterpillar Grader: Used monthly for three days Per month grading the Disposal Trench:	$ 3.00	
Grader Fuel: $4.59 per gallon, 0.25 gallons per animal	$ 6.89	
Insurance: $300 per month / 62.5 head per month over the past 45 months:	$ 2.40	
Subtotal per Animal:		$ 45.58

[2] The applicant has calculated the 268 deaths from 2018-April 2019 at 20% of their original adult weight and divided this figure by 5 in order to reach a calculated basis for recognizing the disposal of 268 carcasses to be the equivalent of 53.6 adult animals. The applicant then added this figure to those adult animals directly composted at Disposal Trench 2(C) from May 2019 to the present (3,397) to reach an aggregated total of 3,450.6 animals, and 5,348.43 AU.

b. April 2022 Composting Operation:

Four (4) John Deere Front End Loaders: (17 days (55% of the Monthly operational costs)	$ 1.80	
Loader Fuel: $5.55 per gallon, 1.5 gallons per animal	$ 8.33	
Caterpiller Grader / Pusher:	$ 0.82	
Grader Fuel: $5.55 per gallon, 0.5 gallons per animal	$ 2.78	
Subtotal per Animal:		$ 13.73

Mobilization:

a. 45 Months of Operations:

Labor: 1.8 hours @ $22.50 per hour (including FICA, employment taxes, etc.) for checking ear tag numbers, cataloguing the same, delivering front-end loader to the target pen, harnessing the animal to the front-end loader, removing the animal to a waiting area and then loading the animal carcasses into the compost are with the front-end loader; securing the composting material (pushout feed and manure, water, etc.), and grooming the animal in the Disposal Trench 2(C):	$ 40.50	
Management: (2.5 hrs per week) / 40 hour week salary of $85,000.00 = $106.25 per day and an average of 2.05 cows dying per day for the last 45 months:	$ 51.57	
Employer's Accounting, Overhead:	$ 5.40	
Subtotal per Animal:		$ 97.47

b. April 2022 Composting Operation:

Labor: Total of 136 hours per man @ $22.50 per hour (including FICA, employment taxes, etc.) for checking ear tag numbers, cataloguing the same, delivering front-end loader to the target pen, harnessing the animal to the front-end loader, removing the animal to a waiting area and then loading the animal carcasses into the compost are with the front-end loader; securing the composting material (pushout feed and manure, water, etc.), and grooming the animal in the Disposal Trench 2(C). There were a total of 5 men involved in the operation:	$ 4.17	
Management: 2.5 weeks / 40 hour week salary of $85,000.00 = $106.25 per day and an average of 2.05 cows dying per day for the last 45 months:	$ 1.12	
Employer's Accounting, Overhead:	$ 1.00	
Subtotal per Animal:		$ 6.29

Total per 1,550 lb Animal / Animal Carcass: $367.58

1,000 lb Animal Unit (AU) Calculation: $236.50

Request: 5,348.43 AU x $236.50 per AU: $1,264,920.95

The **Grand Total** of these Requests:

# 1: Compost Facility 2(C):	$ 306,212.40	
# 2: Depopulation	$ 77,120.00	
# 3: Animals Composted to Date:	$1,264,920.95	
Grand Total:		$1,648,253.35

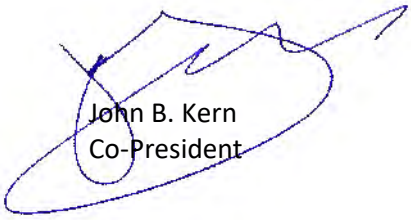
The activities undertaken here will go a long way toward (a) eliminating PFAS exposures across the dairy by concentrating these animal corpses in a lined, protected Disposal Trench impervious to environmental transmission, and (b) prepare the animal residues for removal which is at this time not possible. We recognize that these actions do not completely remediate PFAS from the 3,500 acre dairy farm, including from the soils, from the silage grown in the soils, from the untreated wells, and from the dairy lagoons. Those objectives are beyond the scope of this request, but we are doing all we can do under the circumstances to begin the process of elimination.

We reserve the right to request further assistance with the removal of soils from Compost Facility / Disposal Trench 2(C), if those are determined to have absorbed PFAS contaminants from the remains of the Highland Dairy animal carcasses. This might extend to the need for the removal of the top 4" of topsoil in the Disposal Trench, i.e. 60 to 90 tons of topsoil / clay material. Such an application would be presented in a future fiscal year.

Please advise what further steps should be taken to secure this grant funding at this time.

Thank you and kindest regards.

Very sincerely yours,



John B. Kern
Co-President

Exhibit 15

MICHELLE LUJAN GRISHAM
GOVERNOR

JAMES C. KENNEY
CABINET SECRETARY

MEMORANDUM

TO: James Kenney, Secretary, New Mexico Environment Department

FROM: Chris Catechis, Division Director, Resource Protection Division

DATE: May 2, 2022

SUBJECT: Request for Release of Hazardous Waste Emergency Funds to Provide Emergency Response for Removal and Disposal of PFAS Contaminated Livestock

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With approval of this request, the New Mexico Environment Department (NMED) will utilize the Hazardous Waste Emergency Fund to assist Mr. Art Schaap, the owner and operator of Highland Dairy, a business located in Clovis, New Mexico, with expenses associated with the proper disposal of per-and polyfluoroalkyl substances (PFAS) contaminated livestock in accordance with an NMED-approved plan for depopulation and disposal.

Contamination of the dairy herd resulted from groundwater used by Highland Dairy that was polluted by the U.S. Air Force. The U.S. Air Force caused a PFAS plume in the aquifer from the use and disposal of PFAS-containing materials at Cannon Air Force Base. Highland Dairy is not currently a transportation, storage, or disposal facility; and Mr. Schaap did not dispose of the PFAS that caused the initial contamination. However, NMED has consistently required corrective action for PFAS contamination pursuant to the Hazardous Waste Act, NMSA 1978, Sections, 74-4-1 to –14, as PFAS meets the statutory definition of hazardous waste found at NMSA 1978, Section 74-4-3(K) due to the threat it poses to human health and the environment. This application of the HWA to PFAS is consistent with existing U.S. Environmental Protection Agency (EPA) guidance, as well as New Mexico's ongoing litigation with the U.S. Department of Defense (DOD) to compel remediation of the PFAS contamination via the Hazardous Waste Act.

Since August 2020, Highland Diary has managed the mortalities through onsite burial. As of April 30, 2022, Highland Dairy has euthanized its entire contaminated herd. Pursuant to the revised dairy indemnification rule issued by the U.S. Department of Agriculture, Farm Service Agency (FSA) on December 13, 2021,[1] NMED is the appropriate state agency to approve a removal plan submitted by Mr. Schaap to take advantage of the Dairy Indemnity Payment Program for Highland Dairy. The preamble to the final rule provides, "The removal plan must provide FSA, to the satisfaction of the FSA county committee, a timeline of all aspects of cow removal, how and where cows will be depopulated, including how the cows and chemical residues, if applicable, will be disposed of, and documentation of the approval of the removal plan from the applicable public agency." Implementing an approved removal plan will require disposal at a licensed hazardous waste disposal facility for PFAS-contaminated carcasses and PFAS-contaminated soil or composted material associated with herd mortalities.

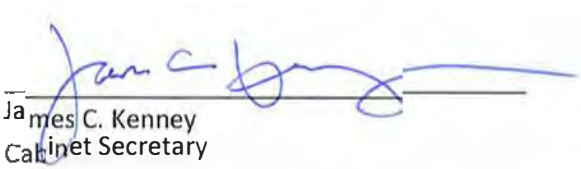
[1] Supplemental Dairy Margin Coverage Payment; Conservation Reserve Program; Dairy Indemnity Payment Program; Marketing Assistance Loans, Loan Deficiency Payments, and Sugar Loans; and Oriental Fruit Fly Program, 86 Fed. Reg. 70,689 (Dec. 13, 2021).

In making this request, I have considered that discarded PFAS waste is hazardous under state law, as described above. In addition, I referred to the U.S. EPA's Administrator Michael Regan's October 26, 2021, response letter to Governor Michelle Lujan Grisham's petition. According to this letter, the U.S. EPA intends to include specific PFSA chemicals as RCRA Hazardous Constituents to ensure they are subject to corrective action requirements as an initial step to regulate PFAS as a listed hazardous waste. The U.S. EPA also stated it intends to clarify federal regulations to ensure the RCRA Corrective Action Program has the authority to require investigation and cleanup for wastes that meet the statutory definition of hazardous waste, as defined under RCRA section 1004(5). This modification would clarify that emerging contaminants such as PFAS can be cleaned up through the RCRA corrective action process. In addition, I have considered the human health risks associated with PFAS contamination in the environment, the extremely large volume of waste to be generated at Highland Dairy, and the associated estimated costs of hazardous waste disposal. Improper handling and disposal of mortalities of the Highland Dairy herd could result in new or expanded PFAS-contaminated groundwater in the Clovis area, which is already the subject of an imminent and substantial endangerment lawsuit related to PFAS. Furthermore, onsite disposal of hazardous waste is prohibited under state law.

For the reasons stated above, I recommend your approval for the use of the Hazardous Waste Emergency Fund for emergency response assistance to Highland Dairy to properly remove, remediate, transport and dispose of PFAS-contaminated carcasses and associated contaminated materials, including soil in areas on the dairy's property used for onsite burial. The current fund balance of the Hazardous Waste Emergency Fund is $2,021,515. Upon authorization, the Hazardous Waste Bureau staff will begin assisting Mr. Schaap.

Approval

By my signature below, I concur that the circumstances outlined above constitute a "hazardous substance incident" as defined in 74-4-3.H NMSA 1978. The activities outlined in this memorandum are authorized under 74-4-8 NMSA 1978. I hereby authorize release of the Hazardous Waste Emergency Fund for this work in an amount not to exceed $850,000.



James C. Kenney
Cabinet Secretary
New Mexico Environment Department

5-4-2022
Date

Exhibit 16

INVOICE

HIGHLAND DAIRY

Family Owned and Operated since 1992

650 Curry Road O
Clovis, New Mexico 88101
Attn: Art Schaap
Tel (575) 760-6455
art.schaap@icloud.com

INVOICE NO.	22-NMED-01
DATE	6/30/2022
PERIOD	Current
CUSTOMER ID	NMED

TO

NEW MEXICO ENVIRONMENT DEPARTMENT
Resource Protection Division
Harold Runnels Building, Ste. 4050
1190 St. Francis Drive
Santa Fe, New Mexico 87502
Attn: Chris Catechis, Acting Director
Bruce Baizel, Esq., General Counsel
chris.catechis@state.nm.us; bruce.baizel@state.nm.us

TOPIC	PAYMENT TERMS
Hazardous Waste Disposal - PFAS in the Highland Dairy cattle herd (3,665 head of Adult Dairy Cows presently in compost pursuant to USDA FSA Disposal & Removal Plan approved by NMED on May 20, 2022, and as reflected in the NM Hazardous Waste Fund Application of May 12, 2022.) This application pertains only to services provided in FY '21-22, with 2,308 deaths recorded in that time frame, with 3,450.6 animal carcasses placed in compost in Disposal Trench 2C during this time frame (taking into consideration the diminution in carcass weights as a result of prior composting activities), and with calculations where applicable to the 3,665 animals composted in total.	Upon Receipt & Approval

DESCRIPTION	QUANTITY	RATE	TOTAL
1. Establishment of Composting Facility. Disposal Trench 2C measuring 74' x 200' x 12' depth on the Highland Dairy Premises (costs measured in square footage per NRCS regulations)	14,800	$20.69	**$306,212.00**
2. Depopulation Exercise of PFAS Contaminated Cows. Euthanization of 964 head of adult cows from December 2021 and April 2022	964	$80.00	**$77,120.00**
3. Composting of Deceased Adult Cow Carcasses.			
3.a Materials.			

a.1 Pushout Feed. Includes 4.8 tons per animal @ $165.00 per ton, discounted by 80%	3,450.60	$158.40	**$546,575.04**
a.2 Manure. 500 lbs per animal @ $40.00 per ton	3,450.60	$10.00	**$34,506.00**
a.3 Monthly Water Applications	3,450.60	$0.85	**$2,933.01**
a.4 Top-Layer of Manure. 500 tons	3,450.60	$30.08	**$103,794.05**
a.5 Fencing Material. Surrounding Disposal Trench 2C (to be acquired in FY '22-'23)	1,477.00	$0.00	**$0.00**
3.b Equipment			
b.1 July '21 - June '22 Cattle Composting Operations.			
1.a John Deere Front-End Loader. Used daily for 50% of the operations, $3,000 per month for 10 months (July '21 to April '22)	10.00	$1,500.00	**$15,000.00**
1.b Loader Fuel. $4.59 per gallon, 1.5 gallons per animal	2,308.00	$6.89	**$15,890.58**
1.c Loader Insurance. $300 per month for 10 months	10.00	$300.00	**$3,000.00**
1.d Caterpillar Grader. Used monthly for three days / 10 mo. grading the Disposal Trench.	10.00	$360.00	**$3,600.00**
1.e Grader Fuel. $4.59 per gallon, 0.25 gallons per animal	2,308.00	$1.15	**$2,648.43**
1.f Grader Insurance.	10.00	$300.00	**$3,000.00**
b.2 April 2022 Composting Operation			
2.a Four John Deere Front-End Loaders. 17 days (55% of monthly cost)	4.00	$1,650.00	**$6,600.00**
2.b Loader Fuel. $5.55 per gallon, 1.5 gallons per animal	3,450.60	$8.33	**$28,726.25**
2.c Caterpillar Grader / Pusher.	1.00	$3,000.00	**$3,000.00**
2.d Grader / Pusher Fuel. $5.55 per gallon, 0.5 gallons per animal	3,450.60	$2.78	**$9,575.42**
4. Mobilization			
4.a 10 Months of Operations (June '21 to April '22)			
a.1 Labor. 1.8 hrs @ $22.50 per hour (including FICA, taxes, etc.) for individually deceased animals. Rate calculated per deceased animal and therefore incorporates costs for the 2,308 but excludes the 866 animals deceased prior to the 866 head depopulated in April 2022.	1,442.00	$40.50	**$58,401.00**
a.2 Management. 2.5 / 40 hours per week, salary of $85,000 at an average of 2.05 cows dying per day for 10 months	10.00	$456.92	**$4,569.18**
a.3 Employer's Accounting, Overhead.	3,665.00	$5.40	**$19,791.00**
4.b April 2022 Composting Operation.			
b.1 Labor. Total of 136 hours per worker @ $22.50 (including FICA, taxes, etc.)**.** Five workers.	5.00	$3,060.00	**$15,300.00**

b.2 Administrative Support. Professional advisory and compliance services @ $300.00 / hr	260.00	$300.00	**$78,000.00**
b.3 Management. Two managers, 150 hours each, based on salary of $85,000 p.a.	300.00	$42.50	**$12,750.00**
b.4 Employer's Accounting, Overhead.	3,665.00	$1.00	**$3,665.00**
Grand Total for FY '21-'22 Only			**$1,354,656.95**
Reduction for Limitation of Haz. Waste Fund for FY '21-'22	**-37.25%**		**-$504,656.95**
Adjusted Invoice Total			**$850,000.00**
Finance Charge	$0.00	1.50%	**$0.00**
		TOTAL	**$ 850,000.00**

Payable by Check to: "Highland Dairy"

Thank You!

US Tax ID No.: 85-0359714

Summary | Related Documents | Invoice Information | Payments | Voucher Attributes | Error Summary

Business Unit	66700	**Invoice Date**	06/30/2022
Voucher ID	00142476	**Invoice No**	PY 22-NMED-01
Voucher Style	Regular	**Invoice Total**	850,000.00
Supplier Name	ART SCHAAP HIGHLAND DAIRY 650 CURRY RD O CLOVIS, NM 88101-0000		
Entry Status	Postable	**Pay Terms**	Pay Now
Match Status	No Match	**Voucher Source**	Online
Approval Status	Approved	**Origin**	ONL
Post Status	Posted	**Created On**	09/02/2022 11:59AM
		Created By	JESSICA.TAPIA
		Last Update	09/02/2022 4:57PM
Budget Status	Valid	**Modified By**	JESSICA.TAPIA
		ERS Type	Not Applicable
Budget Misc Status	Valid	**Close Status**	Open

Approval History

***View Related** Payment Inquiry Go

Return to Search | Notify | Refresh | Add | Update/Display

Payment

Search Criteria

	From	To
Search Name	ALL	
From Supplier Name 1		
Supplier Location		
*Amount Rule	Any	
Amount		
*Currency		
Bank SetID	00000	
Bank Code	WFB10	
Bank Account	0002	
Bank Account #		
From Ref ID	2001292137	2001292137
From Payment Date		
Payment Method		
Pay Cycle		
Seq Num		
Payment Status		
Remit SetID	00000	
Remit Supplier	0000167967	
Settle By		
Settlement Status		

☐ Single Payment Vouchers

Max Rows 300 Search Clear Keyword Search

☐ Show Chart *Chart Type Bar Chart

Sorting Criteria

Payment

1st sort Bank Account ☐ Descending

2nd sort Payment Reference ID ☐ Descending

Sort

Payment Inquiry Result

1-1 of 1 View All

Payment Details | Additional Info | Supplier Details | Financial Gateway

Actions	Source	Payment Reference ID	Payment Method	Amount	Currency	Creation Date	Payment Date	Payment Status	Reconciliation Status	Reconcile Date
Actions	VCHR	2001292137	System Check	850,000.00	USD	09/02/2022	09/06/2022	Paid	Reconciled	09/23/2022

MICHELLE LUJAN GRISHAM
GOVERNOR

JAMES C. KENNEY
CABINET SECRETARY

Date: August 31, 2022 **PY 22-01**

To: Danielle Gilliam, Acting Chief Financial Officer Danielle Gilliam 2022.09.02 10:58:43 -06'00'

Thru: Miquella Lopez, Program Financial Manager Miquella Lopez Digitally signed by Miquella Lopez Date: 2022.08.31 09:43:56 -06'00'

From: Jessi Sanchez, Hazardous Waste Bureau Financial Manager Jessi Sanchez Digitally signed by Jessi Sanchez Date: 2022.08.31 09:12:10 -06'00'

Subject: Prior Year Early Approval Justification - Art Schapp, Highland Dairy - Supplier ID# 0000167967

The Hazardous Waste Bureau (HWB) is requesting early approval for a prior year payment in the amount of $850,000.00 payable to Art Schapp, Highland Dairy, for Invoice # 22-NMED-01 dated 6/30/2022.

This payment is for cleanup of an emergency hazardous substance incident that had to be addressed immediately to ensure public safety & follow state law NMSA 1978, Section 74-4-8. The initial cost of cleanup was incurred by Art Schapp, Highland Dairy after the incident occurred. The New Mexico Environment Department (NMED) Cabinet Secretary approved use of the Hazardous Waste Emergency Fund to partially cover costs associated with cleanup to Mr. Schaap on May 2022. However due to key position turnovers in NMED we were not able to proceed with the payment process in a timely matter, but it is necessary that NMED fulfill the promise of assistance to Mr. Schaap as soon as possible.

NMED will utilize the Hazardous Waste Emergency Fund to assist Mr. Art Schaap, the owner and operator of Highland Dairy, a business located in Clovis, New Mexico, with expenses associated with the proper disposal of per-and polyfluoroalkyl substances (PFAS) contaminated livestock in accordance with an NMED-approved plan for depopulation and disposal. The payment was not completed in FY22 because the Hazardous Waste Bureau did not have sufficient budget in place to pay the invoice when the hazardous substance incident occurred. Due to turnover in key position and lack of resources department missed the FY22 BAR deadline. Therefore, HWB had to wait for FY23 to open to process a BAR to bring in budget to pay this invoice.

Due to the absence of budget authority in FY22 we could not encumber this expense on time. However, due to the nature of this transaction (one time) and based on NMSA 1978, section 74-4-3, we believe this is only a MAPs violation and not a procurement violation. Please see attached memo approved by the Environment Department Secretary, James Kenney.

Please use the following information to pay prior year payment:

Payment for Invoice Number:	22-NMED-01
Fund:	06400
Budget Ref:	123
Class:	G0000

Account Code:	547999
Sub-account: (when applicable)	SRF95700
Department Code:	3500000000

Corrective action in place to avoid Prior Year requests in the future:

In the future the cabinet secretary, division director, and bureau chief will communicate decisions to cover cost for emergencies immediately with budget section and financial manager to come up with a plan to avoid this type of occurrence and prior year payment.

If you have any questions regarding this matter, please feel free to contact me at (505) 827-2855
Sincerely,

Danielle Gilliam
2022.09.02 10:59:00
-06'00'

Danielle Gilliam, Acting Chief Financial Officer
danielle.gilliam@state.nm.us

Exhibit 17

NEW MEXICO
ENVIRONMENT DEPARTMENT

Ground Water Quality Bureau
1190 South St. Francis Drive (87505)
P.O. Box 5469, Santa Fe, New Mexico 87502-5469
Phone (505) 827-2900 Fax (505) 827-2965
www.env.nm.gov

SUSANA MARTINEZ
Governor

JOHN A. SANCHEZ
Lieutenant Governor

BUTCH TONGATE
Cabinet Secretary

J.C. BORREGO
Deputy Secretary

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

September 26, 2018

Mr. Chris Segura
Chief, Installation Support Section
AFCEC/CZOW
2050 Wyoming Blvd SE, Suite 124
Kirtland AFB, NM 87117-5270

RE: Soil and groundwater contamination with per- and poly-fluoroalkyl substances Cannon Air Force Base, Clovis, New Mexico

Dear Mr. Segura:

The New Mexico Environment Department ("NMED") is in receipt of the U.S. Air Force ("USAF") Site Investigation Report ("SIR") concerning the presence of per- and polyfluoroalkl ("PFAS") compounds, specifically perfluorooctane sulfonic acid ("PFOS") and perfluorooctanoic acid ("PFOA"), (collectively "PFOS/PFOA") in groundwater and soils at Cannon Air Force Base ("CAFB"). PFAS are environmentally persistent, mobile in groundwater, and bioaccumulate in the food web.

According to the SIR, the USAF conducted a preliminary assessment of PFAS at CAFB in 2015, and a scoping site visit was held in 2016. The USAF identified 14 sites where Aqueous Film Forming Foam ("AFFF") may have been released at CAFB. These 14 sites included firefighter training areas, hangar fire suppression systems, firefighting equipment testing and maintenance areas, and emergency response sites for fuel spills and aircraft mishaps. In November and December 2017, the Air Force collected soil and groundwater monitoring well samples at and near the 14 sites where AFFF may have been released. These soil and groundwater samples were analyzed for PFAS compounds.

During a conference call on August 13, 2018, the Air Force informed NMED that PFAS compounds had been detected in groundwater at CAFB at concentrations exceeding the U.S.

Environmental Protection Agency ("EPA") Drinking Water Health Advisory Level of 70 nanograms per liter ("ng/L"). The EPA Drinking Water Health Advisory applies to PFOS and PFOA, individually or combined. Later in the day on August 13, 2018, NMED informed the Air Force by email that, "[t]he detection of contaminants in groundwater is a notifiable discharge even if the specific date, sources and volumes of the discharge are not yet known." NMED's email requested that the Air Force provide a formal notice of discharge to NMED pursuant to New Mexico Ground and Surface Water Protection regulation 20.6.2.1203.A(1) NMAC, within 24 hours.

The Air Force provided official notification of the discharge by email on August 14, 2018 and submitted a written SIR to NMED on August 27, 2018. The Site Investigation report describes the history of AFFF use and potential AFFF releases on CAFB and includes PFAS test results for soil and groundwater monitoring wells on-Base. PFAS were detected in numerous soil samples, and in 10 of 18 monitoring wells tested. The highest concentrations of PFAS (up to 26,200 ng/L) were detected in monitoring wells located near the southeastern corner of CAFB. PFOS was detected at a concentration of 24,000 ng/L and PFOA was detected at a concentration of 2,200 ng/L. The Air Force's August 14, 2018 notification of discharge also stated that the Air Force was going to conduct an expanded Site Investigation "to determine any potential impact to off-site domestic/livestock wells down-gradient from the installation boundary."

Pursuant to WQCC regulation 20.6.2.1203.A(7) NMAC, NMED hereby conditionally approves the Site Investigation report that was submitted by the Air Force on August 27, 2018 as an interim Corrective Action report, subject to the following conditions:

1. The Site Investigation report states in *Section 4.2.2, Groundwater Exposure Pathways and Receptors*, "[t]he installation water supply wells were previously sampled as part of the Third Unregulated Contaminant Monitoring Rule for PFAS with no detections reported." The PFAS test results for CAFB water supply wells were not included in the August 2018 Site Investigation Report, and the NMED Drinking Water Bureau has no record of such test results in its files. The Air Force provided sampling results from the 2016 drinking water system analyses to the NMED on September 20, 2018. The report should be amended to state that PFAS compounds were found at low levels in some of the samples.

2. NMED has not conducted a technical review of the SIR. This approval is for administrative completeness only. NMED may issue a notice of deficiency to the USAF after its technical review is completed.

The following additional corrective actions are required pursuant to 20.6.2.1203.A(5) NMAC:

1. NMED concurs with the USAF plan as outlined in the SIR to sample <u>all</u> water supply wells located within four miles of the southeastern corner of CAFB (i.e., the "potential contaminant zone" in the SIR). The USAF shall provide NMED with documentation that the USAF made due diligent and good faith efforts to timely obtain permission from owners of offsite wells in the zone. The USAF shall provide results from all sampling under this condition within forty-five (45) days of the date of this letter.

2. All future testing of soil and water on and near CAFB shall include analysis and quantification of perfluorobutanoate (PFBA, also known as perfluorobutanoic acid, perfluorobutyric acid and heptafluorobutyric acid).

3. Within thirty (30) days of the date of this letter, the Air Force shall resample all on-Base water supply wells for PFAS, including PFBA cited in condition 2 above. Within forty-five (45) days of the date of this letter, the Air Force shall submit a proposal, subject to NMED approval, to conduct a hydrogeologic investigation to define the extent of groundwater contamination by PFAS emanating from CAFB.

4. The Air Force is required to provide alternative drinking water source(s) to all individuals with affected water supplies.

As a reminder, the Air Force is additionally required to comply with all applicable local, state, and federal statutes and regulations applicable to this matter.

If you have any questions regarding this letter, please contact me at (505) 827-2919.

Sincerely,

Michelle Hunter, Chief
Ground Water Quality Bureau
Environment Department

MH:DM

cc: B. Tongate, NMED
B. Yurdin, NMED
J. Witte, NMDA
L. Gallagher, DOH
D. Cox, NMDA
H. Krapfl, DOH
N. McDuffie, NMED-GWQB
J. Kieling, NMED-HWB
S. Stringer, NMED-DWB
S. Kottkamp, USAF
L. King, EPA-Region 6 (6PD-N)
D. McQuillan, NMED-OOTS

Exhibit 18

MICHELLE LUJAN GRISHAM
GOVERNOR

JAMES C. KENNEY
CABINET SECRETARY

Certified Mail - Return Receipt Requested

December 15, 2021

Colonel Terence G. Taylor
Commander, 27th Special Operations Wing
100 Air Commando Way, Suite 100
Cannon Air Force Base
New Mexico 88103-5214

RE: DISAPPROVAL
DRAFT AQUEOUS FILM-FORMING FOAM RELEASE AREAS PHASE I REMEDIAL INVESTIGATION WORK PLAN
CANNON AIR FORCE BASE, NEW MEXICO
EPA ID #NM7572124454
HWB-CAFB-21-002

Dear Colonel Taylor:

The New Mexico Environment Department (NMED) has received the Cannon Air Force Base (Permittee or CAFB) *Draft Aqueous Film-Forming Foom Release Areas Phase I Remedial Investigation Work Plan* (Work Plan), dated June 21, 2021. NMED has reviewed the Work Plan and hereby issues this Disapproval with the following comments.

GENERAL COMMENT

1. **Permittee Issuance of the Work Plan for NMED Review**

NMED Comment: The cover letter for the Work Plan states, "[p]ursuant to the provisions of the Defense Environmental Restoration Program, the Air Force investigation and mitigation actions for PFOS/PFOA are guided under the Comprehensive Environmental Restoration Compensation and Liability Act (CERCLA)." As clarified in NMED's August 17, 2021, *Draft Aqueous Film-Forming Foam Release Areas Phase I Remedial Investigations Work Plan May 2021* letter, NMED does not agree that investigation of per-and polyfluorinated alkyl substances (PFAS) proposed in the Work Plan are subject to review under CERCLA. The investigation is subject to regulation under the Resource Conservation and Recovery Act (RCRA) and the New Mexico Hazardous Waste Act (HWA); therefore, the investigation must be conducted in accordance with the requirements specified in the *Cannon Air Force Base*

Resource Conservation and Recovery Act Hazardous Waste Permit (EPA ID # NM7572124454) (RCRA Permit) dated December 2018. As required by the RCRA Permit, NMED's review of the Work Plan is in accordance with RCRA Permit Section 1.17.1 and 20.4.2 New Mexico Administrative Code (NMAC). The Permittee must remove all references to CERCLA from the revised Work Plan as it is not applicable to corrective action at CAFB, a permitted RCRA hazardous waste facility. The Permittee must revise the Work Plan accordingly.

Failure to submit a revised Work Plan that addresses all NMED comments in this letter will likely result in rejection of the subsequent investigation report and any conclusions contained therein, as well as potentially subject the Permittee to future enforcement actions as outlined in RCRA Permit Section 1.7, Enforcement.

Furthermore, any investigation conducted by the Permittee without NMED approval is performed at risk, and it is likely that NMED will require different or additional work beyond that conducted by the Permittee without an approved work plan. This may include repeating work that does not meet the technical standards described in the RCRA Permit, NMED's 2020 *General Reporting Guidelines for Corrective Action Documents*, as updated (NMED Reporting Guidelines), found at https://www.env.nm.gov/hazardous-waste/guidance-documents/, and NMED's *2019 Risk Assessment Guidance for Site Investigations and Remediation* (RA Guidance), as updated.

SPECIFIC COMMENTS

2. Section 1, Introduction, Page 1-1

Permittee Statement: "The UFP-QAPP [Uniform Federal Policy-Quality Assurance Project Plan] describes and provides specifications for all Phase I RI [Remedial Investigation] activities described in this Phase I RI Work Plan."

NMED Comment: NMED does not review or approve QAPPs or Standard Operating Procedures (SOPs) included in QAPPs. NMED previously clarified this in the February 2, 2012, *Notice of Disapproval Site Investigation at Eight Sites* (NMED Comment Nos. 2 and 3) and other NMED response letters for CAFB document submittals. Additionally, RCRA Permit Section 6.2, Investigation Work Plan, requires that complete and comprehensive descriptions of all proposed investigation methods, procedures, and specifications, be described in the narrative of the Work Plan. RCRA Permit Parts 3 through 5 outline the technical requirements for corrective action investigations and evaluation of the collected data and information to be proposed in a work plan and that are applicable to the scope of work proposed in the Work Plan. For compliance with the RCRA Permit, the Permittee must format the Work Plan in accordance with RCRA Permit Section 6.2 and NMED's Reporting

Guidelines; all reference to a UFP-QAPP and any SOPs removed. The Permittee must revise the Work Plan accordingly.

3. **Section 1.2, Project Scope, Page 1-2**

Permittee Statement: "Preparation of a Phase I Report in general accordance with EPA guidance (EPA 1988) that summarizes information collected during the project."

NMED Comment: The RCRA Permit provides the applicable regulatory standard for the proposed PFAS investigation and reporting. Additionally, any applicable risk evaluation must comply with NMED's RA Guidance, as updated. The Permittee must revise the Work Plan to propose PFAS investigation, data evaluation, and reporting in accordance with the RCRA Permit and NMED guidelines.

4. **Section 1.4, AFFF and PFAS, Page 1-3**

NMED Comment: The Permittee must address the following comments:

a. The Permittee stated, "[t]he Phase I RI [Remedial Investigation] focused on evaluating three PFAS compounds: perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS), which are collectively referred to as PFAS in this document." However, evaluation of only three PFAS compounds is insufficient to address potential contamination in environmental media at the Facility and the surrounding area from additional PFAS compounds. Evaluation of a wider range of PFAS compounds is essential to defining the nature and extent of contamination, understanding the fate and transport of contamination, and development of a more accurate conceptual site model that appropriately fits the work scope objective proposed by the Permittee in Section 1.1, Project Objective. NMED's RA Guidance Section 5.3, PFAS and Table 5-2, PFAS Analyte List, identify twenty-four of the most common PFAS contaminants of concern (COCs) and four PFAS replacement chemicals that must be evaluated during PFAS investigations. The Permittee must revise the Work Plan to propose analyses of investigation samples for the twenty-four PFAS COCs and replacement chemicals listed in NMED's RA Guidance.

b. The Permittee stated, "EPA Regional screening Levels (RSLs) from May 2021 for tapwater or residential soil, which were obtained from the RSL calculator or summary tables set at a hazard quotient of 0.1 will be used to delineate PFOS, PFOA, and PFBS in groundwater, surface water, soil, and sediment." RCRA Permit Part 3, Corrective Action for Solid Waste Management Units and Areas of Concern, outlines the applicable cleanup and screening level criteria for groundwater (Section 3.3.1),

soil and sediment (Section 3.3.2.1), and surface water (Section 3.3.2.2) that must be used for data comparison. As required by RCRA Permit Section 3.3, Cleanup Levels, proposed screening and cleanup levels must meet the cumulative target risk level for carcinogens of 1E-05 and the additive target hazard quotient for non-carcinogens of 1.0. The Permittee must submit all proposed cleanup and screening levels to NMED for review and approval. Permittee-calculated screening levels proposed for use during an investigation must include supporting data and calculations. The Permittee must revise the Work Plan to propose comparison of all PFAS sample analysis data to cleanup and screening criteria that meet the specifications of the RCRA Permit and the RA Guidance.

5. **Section 2.6.6, Wastewater Treatment Plant [WWTP] Sampling, Pages 2-11 and 2-12**

Permittee Statement: "In August 2019, EA Engineering Science and Technology Inc. (EA) collected samples from the influent and effluent of the WWTP [Wastewater Treatment Plant] for analysis of 18 PFAS compounds. One sample was collected from the WWTP influent and effluent and one duplicate sample was collected from the WWTP effluent. The discussion in this section will focus on PFAS compounds of interest to this RI (PFOS, PFOA, and PFBS)."

NMED Comment: This section must discuss the results of the August 2019 WWTP sampling event that addressed eighteen PFAS compounds in its entirety. Consideration of the complete results of the prior sampling event at the CAFB WWTP is essential to proposing an investigation to characterize all contamination at the Facility's potential source areas. Revise the Work Plan to address all contaminants identified during the WWTP sampling. In addition, the Permittee must submit all WWTP sampling event data, or a respective report with the supporting data, to NMED as a separate document. Upon receipt, NMED will include the submittal in the Facility administrative record. The Permittee must revise the Work Plan accordingly.

6. **Section 3.5.1.2, AOI [Area of Interest]-Specific Fate and Transport, Page 3-9**

Permittee Statement: "Impacted surface water and sediment might present a concern for PFAS leaching to groundwater at North Playa Lake, due to the potential downward movement in areas absent of caliche."

NMED Comment: The Permittee's statement that the presence of caliche in the subsurface would limit the potential downward migration of COCs in the subsurface is insufficient to determine whether a soil-to-groundwater pathway exists. A soil-to-groundwater pathway evaluation in accordance with RA Guidance, Section 4.9, Summary of the Migration to Groundwater Pathway and SL-SSLs [soil leachate based-soil screening levels], is required to evaluate site conditions more appropriately at identified AOIs addressed in Section 3.5. The

evaluation may include the development of site-specific risk-based screening levels for COCs for NMED approval and must include multiple lines of evidence to support an incomplete pathway. Appropriate lines of evidence may include, but are not limited to, any combination of information, such as, history of contamination source removal actions, vertical delineation of contamination in the subsurface, depth to groundwater information, physical and chemical characteristics of the COCs, a lack of liquids that would facilitate the downward migration of COCs in the subsurface, and applicable site-specific geology and hydrology. Due to confirmed groundwater impacts by PFAS COCs at CAFB and surrounding areas, the Permittee must revise the Work Plan to propose a rigorous evaluation of the soil-to-groundwater pathway at all AOIs. The Permittee must base the evaluation on data and information collected during the proposed investigation for the potential identification of contamination source areas requiring further investigation and evaluation.

7. Section 4.3, Standard Operating Procedures, Pages 4-1 and 4-2

NMED Comment: Generalized reference to SOPs in the UFP-QAPP is not appropriate as a description of proposed field and data collection methods and procedures. All investigation methods and procedures proposed for use at AOIs must meet the requirements outlined in RCRA Permit Parts 3 through 5 and must be proposed in the body of the Work Plan as outlined in RCRA Permit Part 6.2.8, Investigation Methods and the NMED Reporting Guidelines. The Permittee must revise the Work Plan narrative to describe all proposed methods and procedures specific to investigations at all AOIs in detail, and references to SOPs must be removed.

8. Section 4.4, Field Documentation, Page 4-2

NMED Comment: The Permittee must describe all field documentation procedures referenced as included in UFP-QAPP in detail in Section 4.4 as applicable to the proposed project work at AOIs, as required by RCRA Permit Section 6.2.8 and the NMED Reporting Guidelines. RCRA Permit Par 4 outlines the required field data collection requirements. The Permittee may include all field forms proposed for use for field work documentation in an appendix of the revised Work Plan. The Permittee must revise the Work Plan accordingly.

9. Section 4.7.2, Reporting, Page 4-4

Permittee Statement: "After events 1 [on-and off- base surface soil investigations and off-base groundwater sampling] and 2 [subsurface investigation], the data will need to be analyzed to propose off base monitoring well and lysimeter locations. Therefore, a revised Phase I Work Plan memorandum will be prepared after event 1 and event 2, as described in the graphic below. Revisions will not be made to the UFP-QAPP. It is anticipated that EPA will approve the proposed locations within two weeks of the submittal of the memorandum."

NMED Comment: The investigation is subject to regulation under the RCRA Permit; therefore, the Permittee must submit the proposed Work Plan memorandum, as an addendum to the Work Plan to NMED for review and approval. As required by RCRA Permit Section 1.17, Submissions to the NMED, the addendum must be provided as two hard copies and two electronic copies. Once received, NMED will review the addendum to the Work Plan in accordance with RCRA Permit Section 1.17.1. The Permittee must revise the Work Plan to reflect these requirements for submittal and NMED review of the proposed Work Plan addendum.

10. Section 4.8, Analytical and Data Reporting, Pages 4-4 and 4-5

NMED Comment: The Permittee must address the following comments:

a. The Permittee stated, "[s]ampling as described in the sections below (Sections 4.9, 4.10, 4.11, 4.12, and 4.13) will be analyzed for PFAS on standard turnaround time (10 business days) by liquid chromatography and tandem mass spectrometry [LC/MS/MS] utilizing isotope dilution compliant with DoD [Department of Defense] Quality Systems Manual 5.3. In addition, the composite soil samples collected (Section 4.11) will be analyzed for physiochemical parameters (pH, particle size distribution, TOC [total organic carbon], and cation exchange capacity), in accordance with the methods specified in the UFP-QAPP (Appendix A)."

General reference to analysis methods and quality control sampling in the UFP-QAPP is not appropriate. The Permittee must revise this section discussion to provide specifics for sampling and analysis methods to be used for PFAS analysis of soil, groundwater, surface water, sediment, and pore water and the physiochemical parameters with appropriate reference to any supporting Work Plan tables and figures as required by RCRA Permit Section 6.2.8 and the NMED Reporting Guidelines.

b. As of July 30, 2021, the United States Environmental Protection Agency (EPA) has published final versions of SW-846 Methods 3512 and 8327 for laboratory preparation and analysis of PFAS in non-potable waters. The methods are applicable to samples for groundwater, surface water, and wastewater for use during investigation and cleanup of PFAS contamination. EPA Method 8327 is the determinative method for PFAS sample analysis with LC/MS/MS. The EPA validated methods are the required sample preparation and analysis methods for PFAS analysis of groundwater, surface water, and wastewater, and the Permittee must propose them for use in the revised Work Plan. The Permittee must revise the Work Plan accordingly.

c. The Permittee stated, "[t]he quality control (QC) samples for each type of sampling will be analyzed as outlined in the UFP-QAPP (Appendix A) and in accordance with the required frequencies."

The Permittee must describe QC samples proposed for all sample media in detail in the body of the revised Work Plan pursuant to RCRA Permit Section 6.2.8 and the NMED Reporting Guidelines. The Permittee must revise the Work Plan accordingly.

d. The Permittee stated, "[l]aboratory analytical data will be validated in accordance with the UFP-QAPP, and a data usability assessment will be included in the Phase I RI Report."

Reference to laboratory data validation procedures included in the UFP-QAPP is inappropriate. The Permittee must describe all proposed laboratory data validation procedures in detail in the revised Work Plan pursuant to RCRA Permit Section 6.2.8 and the NMED Reporting Guidelines. Proposed data validation and reporting must comply with NMED's data quality assurance and control procedures and standards specified in RCRA Permit Section 4.5, Chemical Analyses. The Permittee must revise the Work Plan to provide a detailed discussion of the proposed project data validation and reporting procedures that must comply with the requirements of the RCRA Permit.

11. Section 4.9, Groundwater Monitoring Well Installations, Page 4-5

Permittee Statement: "The monitoring wells will be constructed and developed per the approved Work Plan and UFP-QAPP (Appendix A) and in accordance with state, county, and CAFB requirements."

NMED Comment: The following comments must be addressed as follows:

a. Reference to the UFP-QAPP is not appropriate and must be removed from the Work Plan. The Permittee must revise the Work Plan to describe in detail all proposed project specific groundwater monitoring and monitoring well installation methods and procedures. This is a requirement of RCRA Permit Section 6.2.8 an the NMED Reporting Guidelines.

b. The scope of work proposed in the Work Plan Section (4.9) is subject to the groundwater monitoring and well installation requirements of RCRA Permit Sections 4.3, Groundwater and Monitoring, and RCRA Permit Part 5, Monitoring Well Construction Requirements. The Permittee must propose a scope of work that meets the RCRA Permit requirements. This Permittee must propose the work scope in the body of the Work Plan. Failure to meet RCRA Permit requirements for

groundwater monitoring and well installation will likely result in the rejection of any groundwater sample data and, if the Permittee identifies significant issues with groundwater monitoring wells, the directive to abandon and replace the monitoring wells. The Permittee must review and revise the Work Plan to ensure technical compliance with the RCRA Permit for groundwater monitoring and monitoring well installation.

12. Section 4.9.2, Drilling and Soil Sample Collection, Page 4-5 and 4-6

Permittee Statement: "During sonic drilling, soil samples will be collected directly from the soil core in accordance with the SOP for Soil Sampling and Analysis of PFAS, in Attachment 1 of the UFP-QAPP (Appendix A)."

NMED Comment: The Permittee must address the following comments:

a. The Permittee must revise this section discussion to describe in detail the methods and procedures for sample collection and drilling as required by RCRA Permit Section 6.2.8 and the NMED Reporting Guidelines. All proposed drilling and sampling activities must comply with the requirements outlined in RCRA Permit Sections 4.2.3 through 4.2.6. The Permittee must revise the Work Plan accordingly.

b. The Permittee must propose monitoring wells for locations in areas identified as PFAS contamination source areas based on site history and soil sampling and, therefore, must include the collection of soil samples at regular intervals to the groundwater table. To allow for vertical delineation of contamination at identified source areas on-and off-base, the Permittee must revise the sampling plan for proposed new monitoring wells (Table 4-4) to propose the collection of at least ten soil samples at regular intervals for laboratory analysis from each boring location, in accordance with that proposed for MW-PW001. The Permittee must propose sample intervals and soil samples collected in accordance with RCRA Permit Section 4.2.3.3. The Permittee must revise the Work Plan accordingly.

13. Section 4.9.3, Monitoring Well Construction, Page 4-6

Permittee Statement: "The wells will be constructed with 4-inch diameter PVC [polyvinyl chloride] Schedule 80 casing with either a 40-foot or 50-foot screen."

NMED Comment: To minimize the potential for sample COC concentration dilution, the screened intervals for all proposed monitoring wells must not extend beyond 30 feet below the groundwater table and must be completed with at least 5 feet of screened interval above the groundwater table. Additionally, to ensure the Permittee collects representative groundwater samples from each monitoring well, the Permittee must complete all

proposed monitoring wells with stainless steel well screen to limit the potential for cross-contamination of groundwater samples for PFAS analysis. Proposed well construction and methods must meet the requirements of RCRA Permit Section 5.2, Well Construction/Completion Methods. The Permittee must revise the Work Plan accordingly.

14. Section 4.9.4, Monitoring Well Development, Page 4-7

Permittee Statement: "Development will then proceed using a submersible pump until water quality parameters stabilize according to the criteria in the SOP (Attachment 1 of the UFP-QAPP)."

NMED Comment: SOPs are not acceptable to describe the proposed procedures. The section discussion must include details regarding water quality parameters that will be measured during development of monitoring wells (e.g., pH, conductivity, temperature, and turbidity), the frequency of data collection, and the applicable stabilization criteria. The Permittee must also describe proposed well development procedures in their entirety in the section discussion and must comply with the requirements of RCRA Permit Section 5.2.5, Groundwater Well Development. The Permittee must revise the Work Plan accordingly.

15. Section 4.10, Groundwater Sampling, Pages 4-7 and 4-8

NMED Comment: The Permittee must address following comments regarding groundwater sample collection in the revised Work Plan:

a. The Permittee must revise this section to discuss the details of on-and off-base sampling of monitoring, irrigation, and domestic wells during the proposed investigation. Providing references in the Work Plan to figures and tables is insufficient to propose the scope of work for groundwater sampling. The Permittee must revise this section to describe the information provided on Tables 4-2 and 4-3 with appropriate reference to the tables and any supporting figures (e.g., Figures 4-1 through 4-4). The section must discuss in detail the monitoring, irrigation, and domestic wells proposed for sampling, details regarding the general location and rationale for sampling each well, procedures for the collection of water level data, the frequency of proposed sampling for each sample type, and all quality assurance data and information to be collected at each location as required by RCRA Permit Section 6.2.9, Monitoring and Sampling Program and the NMED Reporting Guidelines. The Permittee must conduct all proposed groundwater sampling and data collection in accordance with RCRA Permit Section 4.3, Groundwater and Monitoring. The Permittee must describe any proposed sampling methods and procedures specific to sampling groundwater for PFAS COCs in detail. If described elsewhere in the Work Plan, the Permittee must provide appropriate references. The Permittee must revise the Work Plan accordingly.

b. The Permittee stated in Section 4.10.3, "[a]s part of the QC process, field QC samples will also be collected in accordance with UFP-QAPP (Appendix A)."

The Permittee must provide details regarding collection of QC samples in the body of the Work Plan and discuss in detail as required by RCRA Permit Section 6.2.8 and the NMED Reporting Guidelines. All proposed QC samples must meet the sample collection specifications outlined in RCRA Permit Section 4.3.5, Groundwater Sample Types. The Permittee must discuss any project specific QC sampling in detail in the section. The Permittee must revise the Work Plan accordingly.

16. Section 4.11, Potential Source Area Sampling, Pages 4-8 to 4-10

NMED Comment: Based on NMED's review of Section 4.11, referenced Table 4-4, and Figures 4-1 through 4-8, the Permittee must address the following comments:

a. The discussion does not adequately address all sampling listed on Table 4-4, Summary of Proposed Surface and Subsurface Soil Sampling Locations. As an example, supporting Section 4.11.2, Soil Sample Collection, addresses sixteen proposed borings at the North Playa Lake and Whispering Winds Golf Course, but it fails to address the additional proposed soil sampling for on-base surface soils at forty locations and for off-base surface soil samples at six locations also listed on Table 4-4. To address this issue, the Permittee must revise the discussion to describe all on- and off-base soil sampling, all methods and procedures to be used, and the sampling program for each AOI proposed separately, with appropriate references to Table 4-4 and any supporting figures, as required by RCRA Permit Sections 6.2.8 and 6.2.9 and the NMED Reporting Guidelines.

b. In Section 4.11.2, Soil Sample Collection, the Permittee stated, "[s]oil samples will be collected from hand augers and/or stainless-steel split-spoon samplers during hollow-stem auger (HAS) drilling, in accordance with the SOP for Soil Sampling and Analysis of PFAS (Attachment 1 of the UFP-QAPP in Appendix A)".

The Permittee must remove reference to the QAPP and SOP and must describe all sampling methods and procedures in detail in the section text. The proposed methods and procedures for soil sampling must conform to the requirements of RCRA Permit Section 4.2.3.3, Soil Sampling. The Permittee must revise the Work Plan accordingly.

c. In Section 4.11.2, the Permittee stated, "[a]s part of the QC process, QC samples will also be collected in accordance with UFP-QAPP (Appendix A)"

The Permittee must describe the QC process and samples to be collected in the appropriate sections of the Work Plan for soil samples. The Permittee must propose QC samples in accordance with the requirements of RCRA Permit Section 4.2.6, Soil Sample Types. The Permittee must revise the Work Plan to conform to the requirements of the RCRA Permit for QC sample collection.

d. Figure 4-6 indicates advancement of only two soil borings (SB02001 and SB02002) to 30 feet bgs at Former Fire Training Area No. 3 (Solid Waste Management Unit (SWMU) 107). Based on historical investigations previously conducted at SWMU 107, the soil borings are not located in areas of identified contamination associated with use of the site as a fire training area (e.g., hydrocarbon, solvents, and metals), and likely, where AFFF has also been used. The Permittee must complete the appropriate level of due diligence and propose additional boring locations where it identified characteristic fire training area contamination. The Permittee must propose soil sample collection to 50-ft bgs for PFAS analysis and collect samples pursuant to the requirements of RCRA Permit Section 4.2.3.3. The Permittee must revise the Work Plan accordingly

e. Based on historical site investigation information for Former Fire Training Area No. 4 (SWMU 109), soil boring SB03003 does not appear to be located at the actual location of the former vehicle chassis fire training pit where AFFF would have been directly applied. The Permittee must complete the due diligence to accurately locate the vehicle chassis fire training pit and propose the advancement of an additional boring to 50 feet bgs for PFAS contamination delineation at that location. The Permittee must propose soil sampling and collect samples pursuant to the requirements of RCRA Permit Section 4.2.3.3. The Permittee must revise the Work Plan accordingly.

f. The Work Plan proposes sampling at locations along the periphery of the mapped Active Fire Training Area (RCRA Area of Concern JJJ) and at down gradient locations from the wastewater evaporation pond. Based on elevated concentrations of PFAS reported at locations near the evaporation pond, the advancement of at least three additional borings to 30 feet bgs, within the fire training area boundary mapped on Figure 4-6 at locations surrounding the aircraft mockup and wastewater collection pit, appear warranted for complete site characterization. The Permittee must propose soil sampling and collect samples pursuant to the requirements of RCRA Permit Section 4.2.3.3. The Permittee must revise the Work Plan accordingly.

g. The Permittee must vertically and horizontally delineate all encountered PFAS contamination in surface and subsurface soil and groundwater at all AOIs. If the Permittee has not delineated the encountered PFAS contamination, the Permittee must advance additional borings and collect soil samples for PFAS analysis until the

contamination has been completely delineated as required by RCRA Permit Sections 4.2.3.1 and 4.2.3.3. The Permittee must revise the Work to address this comment.

17. Section 4.12.2, Surface Water and Sediment Sample Collection, Page 4-10

Permittee Statement: "A surface water sample and sediment sample will be collected at each of the twelve locations following procedures in the *Surface Water Sampling and Analysis of PFAS and Sediment Sampling and Analysis of PFAS* SOPs in the UFP-QAPP (Attachment 1 of Appendix A)."

NMED Comment: Reference to the QAPP and SOPs is inappropriate for description of the proposed surface water and sediment sampling and must be removed from the section discussion. The Permittee must discuss the proposed sampling program, methods, procedures, and QC sampling for surface water and sediment sampling in detail with appropriate references to other supporting Work Plan sections, tables, and figures. The Permittee must ensure that the proposed sampling program methods and procedures meet the requirements of RCRA Permit Parts 3 and 4. The Permittee must revise the Work Plan accordingly.

18. Section 4.13.5, Pore Water Sample Collection, Page 4-13

NMED Comment: The Permittee must revise this section to discuss in detail the proposed QC sampling plan and procedures. Reference to the UFP-QAPP is inappropriate.

19. Section 4.14, Reporting, Page 4-14

NMED Comment: The Permittee must address the following comments:

a. As clarified by NMED Comment No. 1, General Comment, of this letter, PFAS and the proposed PFAS investigation are regulated under the RCRA Permit; therefore, the investigation report must conform to the requirements of Permit Section 6.3, Investigation Report and the NMED Reporting Guidelines. The Permittee must report all information and data collected during the investigation in the format required by the RCRA Permit. The Permittee must revise the Work Plan to include this requirement.

b. The Permittee stated, "[r]ecommendations will be included for any additional data collection that may be needed to conduct the risk assessment component of the CERCLA process." Risk assessment pursuant to CERCLA does not apply to this investigation. The Permittee must conduct proposed risk assessment in accordance with NMED's RA Guidance. Remove all references to CERCLA from the revised Work Plan and revise the Work Plan accordingly.

c. Propose work plan addendum and investigation report submittal schedules for NMED approval based on the anticipated field investigation schedule as required by RCRA Permit Section 6.2.10, Schedule and the NMED Reporting Guidelines. The Permittee must revise the Work Plan accordingly.

20. Table 2-1, Existing On-Base Monitoring Well Construction Information

NMED Comment: NMED noted discrepancies in monitoring well casing diameter, top of casing/measuring point elevations, top and bottom of well screening depth, well screen lengths, and bottom of well data presented on the table when compared with data and information previously documented in NMED-approved CAFB biennial periodic monitoring reports. Revise Table 2-1 to include accurate well completion data and information.

21. Table 4-1, Proposed Remedial Investigation Scope of Sequencing

NMED Comment: The Permittee must revise Table 4-1 to include the proposed sampling for Active Fire Training Area (AFFF Area 11) for sampling Events 1 and 2. The Permittee must revise the table for accuracy.

22. Appendix A: Uniform Federal Policy Quality Assurance Project Plan

NMED Comment: NMED does not review or approve QAPPs or any included SOPs. The Permittee must remove the UFP-QAPP included as Appendix A from the Work Plan and document and discuss all methods and procedures for sampling, data quality assurance and objectives, and other pertinent supporting project information in detail in the appropriate sections of the Work Plan as required by RCRA Permit Sections 6.2.7 through 6.2.13 and the NMED Reporting Guidelines. The Permittee must revise the Work Plan accordingly.

23. Appendix B: Generalized Stratigraphic Column of the Southern High Plains Aquifer Beneath Cannon Air Force Base (Figure 2 AECOM 2020)

NMED Comment: The Permittee must remove Appendix B from the Work Plan and submit the cited 2020 *Technical Memorandum, Cannon Air Force Base Site Conceptual Model* (Technical Memorandum) as a separate document that will be included in the Facility administrative record. The Permittee must also remove reference to the generalized stratigraphic column from the proposed sampling plan (e.g., Section 4.11.2) as it does not appear to be an accurate representation of site conditions at CAFB and the surrounding area. The Permittee may only list the Technical Memorandum in Section 5, References; and it must be appropriately cited in the Work Plan, as deemed necessary for generalized descriptions of site stratigraphy. The Permittee must revise the Work Plan accordingly and provide the memorandum as a separate document.

24. Appendix C: Top of the Dockum Group (Figure 2 AECOM 2020)

NMED Comment: The Permittee must remove the Appendix C figure from the Work Plan and submit the Technical Memorandum separately. The permittee must base characterization of subsurface stratigraphy and geology at CAFB on data collected during the proposed investigation or during other, similar project work at CAFB. Investigation conclusions based on data and information that has not been previously submitted to NMED or approved by NMED may result in invalidation of the Permittee's conclusions and any supporting information and requirement to conduct addition investigation. The Permittee must remove the Appendix C from the Work Plan and submit the Technical Memorandum as a separate document.

25. Appendix D: USGS [United Sates Geological Survey] Potentiometric Surface Maps Summer 2013 and Winter 2015 (USGS 2016)

NMED Comment: The Permittee must remove Appendix D USGS Potentiometric Surface Maps document from the Work Plan and submit the document as a separate document to be included in the Facility administrative record. The document may only be listed in Section 5, References, and must be appropriately cited in the Work Plan, as deemed necessary for generalized descriptions of site conditions. Revise the Work Plan accordingly and provide the document as a separate submittal.

26. Appendix F: Investigation Derived Waste Management Plan [IDWMP]

NMED Comment: The Permittee must address the following comments:

a. Provide additional information regarding the proposed activated granulated carbon treatment of IDW contaminated with PFAS and the treatment system to be used. The IDWMP must be revised accordingly.

b. Fire Training Areas Nos. 3 and 4 (AFFF Areas 2 and 3) are sites where hydrocarbon, solvent, and metals contamination has been previously identified; therefore, the Permittee must revise the IDWMP to also propose sampling for gasoline and diesel range organics, volatile organic compounds, and metals for solid and liquid IDW generated during field activities at AFFF Areas 2 and 3 in addition to proposed PFAS analysis. The Permittee must revise the IDWMP accordingly.

c. Proposed on-site disposal of IDW solids and liquids must meet the most conservative screening criteria outlined in RCRA Permit Section 3.3, Cleanup Levels, as applicable to the waste media. These standards also apply to PFAS during IDW characterization. However, the Permittee must dispose of all solid and liquid IDW contaminated with

PFAS off-site at an appropriate disposal facility. The Permittee must revise the IDWMP accordingly.

The Permittee must submit a revised Work Plan (2 hard copies and 2 electronic copies) that addresses all comments contained in this Disapproval. In addition, the Permittee must include a response letter that cross-references where NMED's numbered comments are addressed. The Permittee must also submit an electronic redline-strikeout version of the revised Work Plan showing where all changes were made to the Work Plan. The revised Work Plan must be submitted no later than **May 2, 2022**.

If you have any questions regarding this letter, please contact Gabriel Acevedo at (505) 690-5760.

Sincerely,

Rick Shean Digitally signed by Rick Shean Date: 2021.12.15 10:39:14 -07'00'

Rick Shean, Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED HWB
B. Wear, NMED HWB
G. Acevedo, NMED HWB
L. King, EPA Region 6 (6LCRRC)
C. Gierke, CAFB
C. Soto-Lorenzo, CAFB
S. Jennings, CAFB
J. Burgoon, CAFB

File: CAFB 2021 and Reading

Exhibit 19

NEW MEXICO ENVIRONMENT DEPARTMENT

Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6313
Phone (505) 476-6000 Fax (505) 476-6030
www.env.nm.gov

Michelle Lujan Grisham
Governor

Howie C. Morales
Lt. Governor

James C. Kenney
Cabinet Secretary

Jennifer J. Pruett
Deputy Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

June 4, 2019

Colonel Stewart A. Hammons
Commander, 27th Special Operations Wing
110 E. Alison Avenue, Suite 1098
Cannon Air Force Base
New Mexico 88103

RE: REQUEST FOR INFORMATION
CANNON AIR FORCE BASE, NEW MEXICO
EPA ID #NM7572124454

Dear Col. Hammons:

Pursuant to section 74-4-4.3.A of the New Mexico Hazardous Waste Act ("HWA"), NMSA 1978, sections 74-4-1 to 74-4-14, the New Mexico Environment Department ("NMED") hereby requests that the U.S. Air Force, owner and operator of Cannon Air Force Base (the "Air Force" or "Permittee"), provide to NMED the information listed below concerning the release of the emerging contaminants Per- and Poly-Fluoroalkyl Substances ("PFAS") to the environment in association with facility-wide operations at Cannon Air Force Base ("CAFB").

Section 74-4-4.3.A of the HWA provides that "[f]or the purposes of developing or assisting in the development of any rules, conducting any study, taking any corrective action or enforcing the provisions of the Hazardous Waste Act, upon request of the secretary or his authorized representative: any person who generates, stores, treats, transports, disposes of or otherwise handles or has handled hazardous wastes shall furnish information relating to such hazardous wastes. . . ."

The Air Force completed a site inspection at CAFB to assess any potential impacts to soil, sediment, surface water, and groundwater at CAFB from PFAS. The resulting August 2018 *Final Site Inspection Report, Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide* ("AFFF Site Inspection Report") indicated that

PFAS were detected in soil, surface water, and sediment at various sampled locations at CAFB and in groundwater. PFAS was detected and reported in the AFFF Site Inspection Report provide to NMED by the Permittee in groundwater at the eastern and southeastern portions of the CAFB at various locations above the United States Environmental Protection Agency Health Advisory level of 0.07 micrograms per liter (µg/L). In accordance with NMAC 20.6.2.1203(A) the Permittee notified NMED of a release of PFAS to groundwater in association with the historic use of AFFF used during historic firefighter training activities. Perfluorinated compounds are referenced in a CAFB study and in the NMED Risk Assessment Guidance for Site Investigations and Remediation. Due to their unique properties, PFAS are a useful indicator for characterizing groundwater migration pathways and other aquifer parameters. In order for NMED to better understand subsurface conditions related to groundwater at CAFB and surrounding areas, NMED requests the following information:

1. All PFAS soil, groundwater and surface water sample laboratory analytical data from on- or off-site locations;

2. Any soil and groundwater data accessible to the Air Force pertaining to the off-site presence of PFAS in soil, groundwater and surface water;

3. If such information has already been submitted to the New Mexico Hazardous Waste Bureau ("HWB"), identify the document(s) and date(s) of submittal in lieu of resubmitting the documentation;

4. Geographic Information Systems data layers that include the facility boundary polygon, solid waste management unit and area of concern location polygons, facility structure polygons, well location points within CAFB, any well and monitoring well location points within a three-mile radius of the base, if available;

5. All water supply well aquifer test, and analytical and water quality data for CAFB and any available analytical and water quality data for off-site water supply or monitoring wells collected since 1992;

6. Waste Water Treatment System influent and effluent water quality testing data obtained since 1992;

7. All available water quality testing data obtained from North Playa Lake surface water since 1992;

8. The beginning and end dates of the use of Aqueous Film Forming Foam at CAFB and all available information on the locations it was used;

9. The compositions of the firefighting foams used at CAFB since 1970 and that which is currently in use, if different and the dates of use for each type if more than one type of firefighting foam was used;

10. The location of all waste water/sewage treatment systems and associated waste collection points and discharge points for treated and untreated waste waters.

11. All well logs and well construction diagrams for all existing and previously abandoned monitoring wells, water supply wells and piezometers located at CAFB.

Your compliance with this information request is mandatory. Failure to respond fully and truthfully within the time specified herein, or to adequately justify such failure to respond, may result in an enforcement action by NMED pursuant to section 74-4-10 of the HWA. The HWA provides for the imposition of civil penalties for noncompliance. Section 74-4-12 of the HWA provides that any person who violates any provision of HWA "may be assessed a civil penalty not to exceed ten thousand dollars ($10,000) for each day during any portion of which a violation occurs." See also sections 74-4-10.A and B of the HWA. The HWA also provides for criminal fines and imprisonment for knowingly omitting material information or making a false statement or representation in any document used for compliance with section 74-4-11.A(3) of the HWA.

The Permittee may claim confidentiality for any information required by this information request pursuant to the requirements of sections 74-4-4.3.D and F of the HWA, and 20.4.1.100 NMAC (incorporating 40 CFR 260.2).

The required information must be provided to the New Mexico Hazardous Waste Bureau no later than **July 8, 2019**.

If you have any questions regarding this letter, please contact Dave Cobrain at (505) 476-6055 or me at (505) 476-6035.

Sincerely,

John E. Kieling
Chief
Hazardous Waste Bureau

cc: D. Cobrain, NMED
B. Wear, NMED HWB
C. Atencio, NMED OGC
L. King, EPA Region 6 (6MM-RC)
M. Hunter, GWQB
S. Kottkamp, CAFB
C. Gierke, CAFB
D. Canales, CAFB
File: CAFB 2018 and Reading

Exhibit 20

STATE OF NEW MEXICO
Environment Department
MICHELLE LUJAN GRISHAM, GOVERNOR
James C. Kenney, Cabinet Secretary

NEWS RELEASE
For Immediate Release

The Environment Department's mission is to protect and restore the environment and to foster a healthy and prosperous New Mexico for present and future generations.

August 20, 2024

Contact:
New Mexico Environment Department
Drew Goretzka, (505) 670-8911, drew.goretzka@env.nm.gov

State offers free blood tests for PFAS chemicals near Cannon AFB
First round of PFAS blood testing begins the week of Sept. 12

SANTA FE — New Mexico is stepping up to help residents and workers surrounding Cannon Air Force Base near Clovis by offering free blood tests for PFAS, a group of man-made chemicals that can affect your health.

These tests are available to anyone who has lived or worked in certain areas around the base, where PFAS contaminated the local water supply.

PFAS, or per- and polyfluoroalkyl substances, are a group of synthetic chemicals used in a variety of products, including food packaging, nonstick cookware, and certain types of fire-fighting materials. They are often referred to as "forever chemicals" because they do not easily degrade in the environment, building up over time in soil, water and living organisms.

Studies have shown a link between PFAS and numerous adverse health effects, including increased cholesterol, reproductive problems and cancer. Additional information about PFAS is available here.

To help people understand their exposure, the New Mexico Environment Department (NMED), the Department of Health (NMHealth), and the Department of Veterans' Services are joining forces to offer these free tests.

This allows those impacted by the release of PFAS into local groundwater and their healthcare providers to quantify exposure and manage potential health impacts. It also helps NMHealth inform future public health actions, such as working with communities to increase awareness about the importance of testing private wells and providing residents with resources about testing water for PFAS and methods of water treatment.

Together, the state agencies will host a public meeting starting at 6 p.m. on Aug. 27 at the Clovis Civic Center (801 Schepps Blvd., Clovis, New Mexico 88101) to share information with those interested in participating and assist in making appointments. Testing will be performed during two periods: Sept. 12 through Sept. 18 and Oct. 3 through Oct. 9. No PFAS blood testing will be performed at the public meeting on Aug. 27. At this time, only current New Mexico adults who have worked or lived in the white-outlined area of the map attached to this release are eligible. If future testing is warranted, the state may increase eligibility outside this initial area.

"The unfortunate truth is that most of us likely have PFAS in their blood due to the common use of these chemicals in consumer products like non-stick cookware and waterproof clothing," said Environment Department Sec. James Kenney. "However, our residents who live on or near military installations like Cannon Air Force Base may be at significantly higher risk due to the Department of Defense's longstanding practice of releasing PFAS into nearby groundwater. The Department of Defense's lack of responsible and meaningful clean-up outside of Cannon Air Force Base over the last five years increases the risk of exposure to New Mexicans."

"This blood testing project allows residents to be more aware of their contamination level and consult with their healthcare provider in how to manage its potential effects," Kenney continued.

All PFAS blood testing is completely free and totally confidential. From one teaspoon-size blood sample, the laboratory will measure 33 different PFAS commonly found in firefighting foams and consumer goods. Participants will receive their results within three to four months of their appointment via a letter that explains how to understand the data. In addition, NMHealth will offer access to public health staff members via a help line to discuss your results and answer any questions. All participants will be given a $25 physical gift card after completing their appointment.

While there are no medical treatments available to reduce PFAS in your body once you are exposed, there are practical steps you can take to limit further exposure. In addition, sharing PFAS blood testing data with your medical provider can assist in more informative discussions when it comes to prevention and treatment of issues.

"Based on your family health history, your health care provider may recommend further tests," said Department of Health Sec. Patrick Allen. "Issues broadly ranging from high cholesterol, and pregnancy concerns, to types of certain cancers all play a role in what actions your health provider may recommend."

PFAS, primarily from firefighting foams, were discharged into soil at firefighting training areas around Cannon AFB. Those chemicals made their way into the underlying Ogallala Aquifer, which serves as a drinking and agricultural water source for thousands of residents in the Clovis area. Based on tests performed by EPCOR, the area's primary local drinking water supplier, as recently as 2023, public drinking water was deemed safe. NMED does not have information on the PFAS testing cycles of some small public water systems in the area.

Unlike at installations such as Reese Air Force Base in Lubbock, Texas, the U.S. Department of Defense has not cleaned up any of its PFAS plume that migrated off Cannon Air Force Base since its discovery.

Additional information about PFAS is available here.

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Exhibit 21

STATE OF NEW MEXICO

ENVIRONMENT DEPARTMENT
PROFESSIONAL SERVICES CONTRACT **#25-667-1210-44124**

THIS AGREEMENT is made and entered into by and between the State of New Mexico, **ENVIRONMENT DEPARTMENT** hereinafter referred to as the "Agency," and **EASTERN RESEARCH GROUP, INC.**, hereinafter referred to as the "Contractor," and is effective as of the date set forth below upon which it is executed by the General Services Department/State Purchasing Division (GSD/SPD Contracts Review Bureau).

IT IS AGREED BETWEEN THE PARTIES:

1. Scope of Work.

The Contractor shall perform the **Scope of work- Attachment A, which by reference is incorporated herein.**

2. Compensation.

A. The Agency shall pay the Contractor in full payment for services satisfactorily performed pursuant to the Scope of Work. The Agency shall pay the Contractor for expenses for the emergency procurement in the amount of **THREE HUNDRED SEVENTY-THREE THOUSAND FOUR HUNDRED THREE DOLLARS and ZERO CENTS ($373,403.00)** including gross receipts tax.

The total amount payable to the Contractor under this Agreement, including gross receipts tax and expenses, shall not exceed ONE MILLION ONE HUNDRED TWENTY-FIVE THOUSAND DOLLARS and ZERO CENTS ($1,125,000.00). This amount is a maximum and not a guarantee that the work assigned to be performed by Contractor under this Agreement shall equal the amount stated herein. The parties do not intend for the Contractor to continue to provide services without compensation when the total compensation amount is reached. Contractor is responsible for notifying the Agency when the services provided under this Agreement reach the total compensation amount. In no event will the Contractor be paid for services provided in excess of the total compensation amount without this Agreement being amended in writing prior to those services in excess of the total compensation amount being provided.

Approved Subcontractor:
SGS AXYS Analytical Services Ltd. Local Phlebotomist – To be Determined

B. Payment is subject to availability of funds pursuant to the Appropriations Paragraph set forth below and to any negotiations between the parties from year to year pursuant to Paragraph 1, Scope of Work, and to approval by the GSD/SPD. All invoices MUST BE received by the Agency no later than fifteen (15) days after the termination of the Fiscal Year in which the services were delivered. Invoices received after such date WILL NOT BE PAID. Contractor shall submit invoices on the 15th of each month billing for services provided in the previous month. Invoices

shall include proof of payment from the Contractor to APPROVED Subcontractors for services provided under this Agreement.

C. Contractor must submit a detailed statement accounting for all services performed and expenses incurred. If the Agency finds that the services are not acceptable, within thirty days after the date of receipt of written notice from the Contractor that payment is requested, it shall provide the Contractor a letter of exception explaining the defect or objection to the services, and outlining steps the Contractor may take to provide remedial action. Upon certification by the Agency that the services have been received and accepted, payment shall be tendered to the Contractor within thirty days after the date of acceptance. If payment is made by mail, the payment shall be deemed tendered on the date it is postmarked. However, the agency shall not incur late charges, interest, or penalties for failure to make payment within the time specified herein.

3. Term.

THIS AGREEMENT SHALL NOT BECOME EFFECTIVE UNTIL APPROVED BY THE GSD/SPD Contracts Review Bureau. This Agreement shall terminate on **June 30, 2025** unless terminated pursuant to paragraph 4 (Termination), or paragraph 5 (Appropriations). In accordance with NMSA 1978, § 13-1-150, no contract term for a professional services contract, including extensions and renewals, shall exceed four years, except as set forth in NMSA 1978, § 13-1-150.

4. Termination.

A. Grounds. The Agency may terminate this Agreement for convenience or cause. The Contractor may only terminate this Agreement based upon the Agency's uncured, material breach of this Agreement.

B. Notice; Agency Opportunity to Cure.

1. Except as otherwise provided in Paragraph (4)(B)(3), the Agency shall give Contractor written notice of termination at least thirty (30) days prior to the intended date of termination.

2. Contractor shall give Agency written notice of termination at least thirty (30) days prior to the intended date of termination, which notice shall (i) identify all the Agency's material breaches of this Agreement upon which the termination is based and (ii) state what the Agency must do to cure such material breaches. Contractor's notice of termination shall only be effective (i) if the Agency does not cure all material breaches within the thirty (30) day notice period or (ii) in the case of material breaches that cannot be cured within thirty (30) days, the Agency does not, within the thirty (30) day notice period, notify the Contractor of its intent to cure and begin with due diligence to cure the material breach.

3. Notwithstanding the foregoing, this Agreement may be terminated immediately upon written notice to the Contractor (i) if the Contractor becomes unable to perform the services contracted for, as determined by the Agency; (ii) if, during the term of this Agreement, the Contractor is suspended or debarred by the State Purchasing Agent; or (iii) the Agreement is terminated pursuant to Paragraph 5, "Appropriations", of this Agreement.

C. Liability. Except as otherwise expressly allowed or provided under this Agreement, the Agency's sole liability upon termination shall be to pay for acceptable work performed prior

to the Contractor's receipt or issuance of a notice of termination; provided, however, that a notice of termination shall not nullify or otherwise affect either party's liability for pre-termination defaults under or breaches of this Agreement. The Contractor shall submit an invoice for such work within thirty (30) days of receiving or sending the notice of termination. *THIS PROVISION IS NOT EXCLUSIVE AND DOES NOT WAIVE THE AGENCY'S OTHER LEGAL RIGHTS AND REMEDIES CAUSED BY THE CONTRACTOR'S DEFAULT/BREACH OF THIS AGREEMENT.*

D. Termination Management. Immediately upon receipt by either the Agency or the Contractor of notice of termination of this Agreement, the Contractor shall: 1) not incur any further obligations for salaries, services or any other expenditure of funds under this Agreement without written approval of the Agency; 2) comply with all directives issued by the Agency in the notice of termination as to the performance of work under this Agreement; and 3) take such action as the Agency shall direct for the protection, preservation, retention or transfer of all property titled to the Agency and records generated under this Agreement. Any non-expendable personal property or equipment provided to or purchased by the Contractor with contract funds shall become property of the Agency upon termination and shall be submitted to the agency as soon as practicable.

5. Appropriations.

The terms of this Agreement are contingent upon sufficient appropriations and authorization being made by the Legislature of New Mexico for the performance of this Agreement. If sufficient appropriations and authorization are not made by the Legislature, this Agreement shall terminate immediately upon written notice being given by the Agency to the Contractor. The Agency's decision as to whether sufficient appropriations are available shall be accepted by the Contractor and shall be final. If the Agency proposes an amendment to the Agreement to unilaterally reduce funding, the Contractor shall have the option to terminate the Agreement or to agree to the reduced funding, within thirty (30) days of receipt of the proposed amendment.

6. Status of Contractor.

The Contractor and its agents and employees are independent contractors performing professional services for the Agency and are not employees of the State of New Mexico. The Contractor and its agents and employees shall not accrue leave, retirement, insurance, bonding, use of state vehicles, or any other benefits afforded to employees of the State of New Mexico as a result of this Agreement. The Contractor acknowledges that all sums received hereunder are reportable by the Contractor for tax purposes, including without limitation, self-employment and business income tax. The Contractor agrees not to purport to bind the State of New Mexico unless the Contractor has express written authority to do so, and then only within the strict limits of that authority.

7. Assignment.

The Contractor shall not assign or transfer any interest in this Agreement or assign any claims for money due or to become due under this Agreement without the prior written approval of the Agency.

8. Subcontracting.

The Contractor shall not subcontract any portion of the services to be performed under this Agreement without the prior written approval of the Agency. No such subcontract shall relieve the primary Contractor from its obligations and liabilities under this Agreement, nor shall any subcontract obligate direct payment from the Procuring Agency.

9. Release.

Final payment of the amounts due under this Agreement shall operate as a release of the Agency, its officers and employees, and the State of New Mexico from all liabilities, claims and obligations whatsoever arising from or under this Agreement.

10. Confidentiality.

Any confidential information provided to or developed by the Contractor in the performance of this Agreement shall be kept confidential and shall not be made available to any individual or organization by the Contractor without the prior written approval of the Agency.

11. Product of Service -- Copyright.

All materials developed or acquired by the Contractor under this Agreement shall become the property of the State of New Mexico and shall be delivered to the Agency no later than the termination date of this Agreement. Nothing developed or produced, in whole or in part, by the Contractor under this Agreement shall be the subject of an application for copyright or other claim of ownership by or on behalf of the Contractor.

12. Conflict of Interest; Governmental Conduct Act.

A. The Contractor represents and warrants that it presently has no interest and, during the term of this Agreement, shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance or services required under the Agreement.

B. The Contractor further represents and warrants that it has complied with, and, during the term of this Agreement, will continue to comply with, and that this Agreement complies with all applicable provisions of the Governmental Conduct Act, Chapter 10, Article 16 NMSA 1978. Without in anyway limiting the generality of the foregoing, the Contractor specifically represents and warrants that:

1) in accordance with NMSA 1978, § 10-16-4.3, the Contractor does not employ, has not employed, and will not employ during the term of this Agreement any Agency employee while such employee was or is employed by the Agency and participating directly or indirectly in the Agency's contracting process;

2) this Agreement complies with NMSA 1978, § 10-16-7(A) because (i) the Contractor is not a public officer or employee of the State; (ii) the Contractor is not a member of the family of a public officer or employee of the State; (iii) the Contractor is not a business in which a public officer or employee or the family of a public officer or employee has a substantial interest; or (iv) if the Contractor is a public officer or employee of the State, a member of the family of a public officer or employee of the State, or a business in which a public officer or employee of the State or the family of a public officer or employee of the State has a substantial interest, public notice was given as required by

NMSA 1978, § 10-16-7(A) and this Agreement was awarded pursuant to a competitive process;

3) in accordance with NMSA 1978, § 10-16-8(A), (i) the Contractor is not, and has not been represented by, a person who has been a public officer or employee of the State within the preceding year and whose official act directly resulted in this Agreement and (ii) the Contractor is not, and has not been assisted in any way regarding this transaction by, a former public officer or employee of the State whose official act, while in State employment, directly resulted in the Agency's making this Agreement;

4) this Agreement complies with NMSA 1978, § 10-16-9(A)because (i) the Contractor is not a legislator; (ii) the Contractor is not a member of a legislator's family; (iii) the Contractor is not a business in which a legislator or a legislator's family has a substantial interest; or (iv) if the Contractor is a legislator, a member of a legislator's family, or a business in which a legislator or a legislator's family has a substantial interest, disclosure has been made as required by NMSA 1978, § 10-16-7(A), this Agreement is not a sole source or small purchase contract, and this Agreement was awarded in accordance with the provisions of the Procurement Code;

5) in accordance with NMSA 1978, § 10-16-13, the Contractor has not directly participated in the preparation of specifications, qualifications or evaluation criteria for this Agreement or any procurement related to this Agreement; and

6) in accordance with NMSA 1978, § 10-16-3 and § 10-16-13.3, the Contractor has not contributed, and during the term of this Agreement shall not contribute, anything of value to a public officer or employee of the Agency.

C. Contractor's representations and warranties in Paragraphs A and B of this Article 12 are material representations of fact upon which the Agency relied when this Agreement was entered into by the parties. Contractor shall provide immediate written notice to the Agency if, at any time during the term of this Agreement, Contractor learns that Contractor's representations and warranties in Paragraphs A and B of this Article 12 were erroneous on the effective date of this Agreement or have become erroneous by reason of new or changed circumstances. If it is later determined that Contractor's representations and warranties in Paragraphs A and B of this Article 12 were erroneous on the effective date of this Agreement or have become erroneous by reason of new or changed circumstances, in addition to other remedies available to the Agency and notwithstanding anything in the Agreement to the contrary, the Agency may immediately terminate the Agreement.

D. All terms defined in the Governmental Conduct Act have the same meaning in this Article 12(B).

13. Amendment.

A. This Agreement shall not be altered, changed or amended except by instrument in writing executed by the parties hereto and all other required signatories.

B. If the Agency proposes an amendment to the Agreement to unilaterally reduce funding due to budget or other considerations, the Contractor shall, within thirty (30) days of receipt of the proposed Amendment, have the option to terminate the Agreement, pursuant to the termination provisions as set forth in Article 4 herein, or to agree to the reduced funding.

14. Merger.

This Agreement incorporates all the Agreements, covenants and understandings between the parties hereto concerning the subject matter hereof, and all such covenants, Agreements and understandings have been merged into this written Agreement. No prior Agreement or understanding, oral or otherwise, of the parties or their agents shall be valid or enforceable unless embodied in this Agreement.

15. Penalties for violation of law.

The Procurement Code, NMSA 1978 §§ 13-1-28 through 13-1-199, imposes civil and criminal penalties for its violation. In addition, the New Mexico criminal statutes impose felony penalties for illegal bribes, gratuities and kickbacks.

16. Equal Opportunity Compliance.

The Contractor agrees to abide by all federal and state laws and rules and regulations, and executive orders of the Governor of the State of New Mexico, pertaining to equal employment opportunity. In accordance with all such laws of the State of New Mexico, the Contractor assures that no person in the United States shall, on the grounds of race, religion, color, national origin, ancestry, sex, age, physical or mental handicap, or serious medical condition, spousal affiliation, sexual orientation or gender identity, be excluded from employment with or participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity performed under this Agreement. If Contractor is found not to be in compliance with these requirements during the life of this Agreement, Contractor agrees to take appropriate steps to correct these deficiencies.

17. Applicable Law.

The laws of the State of New Mexico shall govern this Agreement, without giving effect to its choice of law provisions. Venue shall be proper only in a New Mexico court of competent jurisdiction in accordance with NMSA 1978, § 38-3-1 (G). By execution of this Agreement, Contractor acknowledges and agrees to the jurisdiction of the courts of the State of New Mexico over any and all lawsuits arising under or out of any term of this Agreement.

18. Workers Compensation.

The Contractor agrees to comply with state laws and rules applicable to workers compensation benefits for its employees. If the Contractor fails to comply with the Workers Compensation Act and applicable rules when required to do so, this Agreement may be terminated by the Agency.

19. Records and Financial Audit.

The Contractor shall maintain detailed time and expenditure records that indicate the date; time, nature and cost of services rendered during the Agreement's term and effect and retain them for a period of three (3) years from the date of final payment under this Agreement. The records shall be subject to inspection by the Agency, the General Services Department/State Purchasing Division and the State Auditor. The Agency shall have the right to audit billings both before and

after payment. Payment under this Agreement shall not foreclose the right of the Agency to recover excessive or illegal payments

20. Indemnification.

The Contractor shall defend, indemnify and hold harmless the Agency and the State of New Mexico from all actions, proceeding, claims, demands, costs, damages, attorneys' fees and all other liabilities and expenses of any kind from any source which may arise out of the performance of this Agreement, caused by the negligent act or failure to act of the Contractor, its officers, employees, servants, subcontractors or agents, or if caused by the actions of any client of the Contractor resulting in injury or damage to persons or property during the time when the Contractor or any officer, agent, employee, servant or subcontractor thereof has or is performing services pursuant to this Agreement. In the event that any action, suit or proceeding related to the services performed by the Contractor or any officer, agent, employee, servant or subcontractor under this Agreement is brought against the Contractor, the Contractor shall, as soon as practicable but no later than two (2) days after it receives notice thereof, notify the legal counsel of the Agency and the Risk Management Division of the New Mexico General Services Department by certified mail.

21. New Mexico Employees Health Coverage.

A. If Contractor has, or grows to, six (6) or more employees who work, or who are expected to work, an average of at least 20 hours per week over a six (6) month period during the term of the contract, Contractor certifies, by signing this agreement, to have in place, and agree to maintain for the term of the contract, health insurance for those employees and offer that health insurance to those employees if the expected annual value in the aggregate of any and all contracts between Contractor and the State exceed $250,000 dollars.

B. Contractor agrees to maintain a record of the number of employees who have (a) accepted health insurance; (b) declined health insurance due to other health insurance coverage already in place; or (c) declined health insurance for other reasons. These records are subject to review and audit by a representative of the state.

C. Contractor agrees to advise all employees of the availability of State publicly financed health care coverage.

22. Invalid Term or Condition.

If any term or condition of this Agreement shall be held invalid or unenforceable, the remainder of this Agreement shall not be affected and shall be valid and enforceable.

23. Enforcement of Agreement.

A party's failure to require strict performance of any provision of this Agreement shall not waive or diminish that party's right thereafter to demand strict compliance with that or any other provision. No waiver by a party of any of its rights under this Agreement shall be effective unless express and in writing, and no effective waiver by a party of any of its rights shall be effective to waive any other rights.

24. Notices.

Any notice required to be given to either party by this Agreement shall be in writing and shall be delivered in person, by courier service or by U.S. mail, either first class or certified, return receipt requested, postage prepaid, as follows:

To the Agency:
Jonas Armstrong
NMED/Office of the Strategic Initiatives
1190 S. St Francis Drive
Santa Fe, NM 87502
505-670-9050 – Jonas.Armstrong@env.nm.gov

To the Contractor:
John Wilhelmi, Vice President
Eastern Research Group, Inc.
561 Virginia Road, Ste 300- Building 4
Concord, MA 01742

25. Authority.

If Contractor is other than a natural person, the individual(s) signing this Agreement on behalf of Contractor represents and warrants that he or she has the power and authority to bind Contractor, and that no further action, resolution, or approval from Contractor is necessary to enter into a binding contract.

Contract ID#25-667-1210-44124

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date of signature by the GSD/SPD Contracts Review Bureau below.

By: Danielle L Gilbai Date: 10/28/2024
James C. Kenney, Cabinet Secretary
New Mexico Environment Department

By: Gloria Lucero Date: 10/28/2024
Agency's Legal Counsel – Certifying legal sufficiency

By: Miranda Ntoko Date: 10/28/2024
Miranda Ntoko, Agency's Chief Financial Officer
New Mexico Environment Department

By: John Wilhelmi Date: 10/28/2024
John Wilhelmi, Vice President
Eastern Research Group, Inc.

The records of the Taxation and Revenue Department reflect that the Contractor is registered with the Taxation and Revenue Department of the State of New Mexico to pay gross receipts and/or compensating taxes.

ID Number: **03-187153004**

By: Ann Marie Lucero Date: 10/28/2024
Taxation and Revenue Department

This Agreement has been approved by the GSD/SPD Contracts Review Bureau:

By: N/A Date:
_ GSD/SPD Contracts Review Bureau

Attachment A – Scope of Work

Eastern Research Group, Inc.

Purpose/Goal:
The purpose and goal of this Scope of Work is to continue an existing effort to conduct per- and polyfluoroalkyl substances (PFAS) public health surveillance through blood sampling clinics/events. Public health surveillance is defined as "the ongoing, systematic collection, analysis, and interpretation of health-related data essential to planning, implementation, and evaluation of public health practice." — Field Epidemiology

Contractor Activities
Specifically, the Contractor shall provide the following services:

Required services are a continuation of an existing effort using systematic scientific collection and analysis methods to identify up to 33 different PFAS commonly found in firefighting foams and consumer goods helping individuals understand their exposure levels and guiding healthcare providers on managing potential health risks. The scope of work includes additional **Sampling Events and Tests** to address this public health threat:

Specific contractor support activities for **Sampling Events and Tests** include:

- A project manager will participate in conference calls with agency leads, reserve a venue in Clovis for the blood testing, coordinate and provide daily updates on field work, and attend the weeklong sampling event.
- A data analyst will prepare an appointment scheduling system for the sampling.
- A hotline will be operated for approximately 5 weeks. Contractor staff will be expected to answer incoming calls, respond to voicemails, and call back individuals who contacted the hotline and did not leave a message. Hotline support must be available in Spanish. The hotline staff are expected to schedule blood test appointments for sampling events.
- Procure all supplies and print all photocopies needed for processing blood test appointments and ship them to Clovis, New Mexico.
- Staff the sampling events. Attendees will include the project manager, five or six contractor staff, and a subcontracted phlebotomist. The staff will be on travel for 8 or 9 consecutive days, depending on their place of origin. The staff at the sampling events must process up to 40 appointments every day of the week, including appointments during evening hours, on Saturday, and on Sunday. At least one person on staff must speak Spanish. The staff will set up the venue, operate the blood testing clinic, and demobilize the venue after all appointments are processed.
- Staff assigned to the venue must have experience processing blood samples into serum. They must have training on centrifuge safety, bloodborne pathogens, sharps safety, personal protective equipment, and HIPAA privacy protections.
- Coordinate laboratory analysis serum samples. The selected laboratory must be able to analyze for up to 33 standard PFAS compounds that are routinely tested using EPA Method 1633.

- Process exposure history questionnaire data.
- Process the laboratory's blood test results into a SAS-ready format. All samples will be sent to an offsite laboratory for PFAS analyses.

Note: The work involves a range of other direct costs (e.g., travel, field equipment, expendable supplies, etc.). The contract vehicle for this work must allow for the full range of other direct costs.

Sampling Event and Tests 3:

- Contractor will implement a third week of PFAS blood testing in and around Clovis, NM.
- The third event of blood testing will include up to 250 appointments.
- The samples must be collected before December 13, 2024.
- Estimated costs for this effort are not to exceed: $373,403.

Additional Sampling Events may be scheduled and approved with mutual agreement between the parties in writing.

New Mexico General Services Department
State Purchasing Division

AGENCY CERTIFICATION FORM

The Environment Department (Agency Name) hereby certifies the following in regard to the attached contractual agreement between the Agency and Eastern Research Group, Inc. (Name of Contractor):

1) This contractor **IS NOT** (circle one) a **former state employee**. (See note below)
2) This contractor **IS NOT** (circle one) a **current state employee** or a **legislator** or the **family member** of a current state employee or legislator, or a **business** in which a current state employee or legislator or family member of the current state employee or legislator has an interest of greater than 20%. (See note below)

NOTE: Former employee requires a Former Employee Affidavit (found on CRB website), PERA letter if contractor retired from State of New Mexico and an AG's letter if contractor separated/retired within the last five years to the date of signed contract. No contract may be awarded to a current state employee or legislator, or to a family member of a current state employee or legislator, or to a business in which any of these persons has an interest greater than 20% unless such contract is awarded pursuant to the Procurement Code, except such persons or businesses cannot be awarded a contract through a sole source or small purchase. (See Section 10-16-1 through 10-16-18 NMSA 1978 for further information.)

3) This Contractor is a (check one): FOR PROFIT VENDOR X
NOT FOR PROFIT VENDOR _____

4) This PSA DOES COMPLY with the Governor's Guidelines for Contract Review and Re-Evaluation and IS an essential contract for the Agency.

Danielle L Gilbert — 10/28/2024
Signature of Agency Representative** — Date

I certify that the information stated in paragraphs 1-3 is true.

John Wilhelmi — 10/28/2024
Signature of Contractor — Date

**Must be a DFA authorized signature

State of New Mexico
Purchase Order

PO Number to be on all Invoices and Correspondence

NM Environment Department
NMED-1190 St. Francis Drive Rm. S4051
Santa Fe NM 87502
United States

Dispatched **Dispatch Via Print**

Purchase Order	Date	Revision
66700-0000044124	10-24-2024	
Payment Terms	**Freight Terms**	**Ship Via**
Pay Now	FOB Destination	Best Way
Buyer	**Phone**	**Currency**
CHARLETTE.PROBST		USD

Supplier: 0000086758
EASTERN RESEARCH GROUP
PO BOX 844035
BOSTON MA 02284-0000
United States

Ship To: NMED-1190 St. Francis Drive Rm S4100
Santa Fe NM 87502
United States

Bill To: NMED-1190 St. Francis Drive Rm S4100
Santa Fe NM 87502
United States

Origin: EXE **Exc\Exc#:** 13-1-99-C

Line-Sch	Item/Description	Quantity	UOM	PO Price	Extended Amt	Due Date
1 - 1	Lab testing due to a critical public health intervention related to public exposure to per- and polyfluoroalkyl (PFAS) substances near Canon Air Force Base. PFAS, or per- and PFAS substances, have contaminated the local water supply. Emergency FY-25001 66700-06400-3500000000-535100-SRF95700- - - -125-I0000	1.00	EA	$373,403.00	$373,403.00	10/24/2024

Schedule Total $373,403.00

Item Total $373,403.00

Total PO Amount $373,403.00

Agency Approval - I certify that the proposed purchase represented by this document is authorized by and is made in accordance with all State (and if applicable Federal) legislation rules and regulation. I further certify that adequate unencumbered cash and budget expenditure authority exists for this proposed purchase and all other outstanding purchase commitments and accounts payable.

Authorized Signature

Exhibit 22

State of New Mexico
Purchase Order

PO Number to be on all Invoices and Correspondence

NM Environment Department
NMED-1190 St. Francis Drive Rm. S4051
Santa Fe NM 87502
United States

Dispatched **Dispatch Via Print**

Purchase Order	Date	Revision
66700-0000044124	10-24-2024	
Payment Terms	**Freight Terms**	**Ship Via**
Pay Now	FOB Destination	Best Way
Buyer	**Phone**	**Currency**
CHARLETTE.PROBST		USD

Supplier: 0000086758
EASTERN RESEARCH GROUP
PO BOX 844035
BOSTON MA 02284-0000
United States

Ship To: NMED-1190 St. Francis Drive Rm S4100
Santa Fe NM 87502
United States

Bill To: NMED-1190 St. Francis Drive Rm S4100
Santa Fe NM 87502
United States

Origin: EXE **Exc\Excl#:** 13-1-99-C

Line-Sch	Item/Description	Quantity	UOM	PO Price	Extended Amt	Due Date
1 - 1	Lab testing due to a critical public health intervention related to public exposure to per- and polyfluoroalkyl (PFAS) substances near Canon Air Force Base. PFAS, or per- and PFAS substances, have contaminated the local water supply. Emergency FY-25001	1.00	EA	$373,403.00	$373,403.00	10/24/2024
	66700-06400-3500000000-535100-SRF95700- - - -125-I0000					

Schedule Total $373,403.00

Item Total $373,403.00

Total PO Amount $373,403.00

Agency Approval - I certify that the proposed purchase represented by this document is authorized by and is made in accordance with all State (and if applicable Federal) legislation rules and regulation. I further certify that adequate unencumbered cash and budget expenditure authority exists for this proposed purchase and all other outstanding purchase commitments and accounts payable.

Authorized Signature

STATE OF NEW MEXICO SPD-101A (04/19)
GENERAL SERVICES DEPARTMENT- PURCHASING DIVISION
TERMS AND CONDITIONS UNLESS OTHERWISE SPECIFIED

1. GENERAL: When the State Purchasing Agent issues a purchase document in response to the Vendors bid, a binding contract is created.
2. VARIATION IN QUANTITY: No variation in the quantity of any item called for by this order will be accepted unless such variation has been caused by conditions of loading, shipping, packing or allowances in manufacturing process, and then only to the extent, if any, specified elsewhere in this order.
3. ASSIGNMENT:
   A: Neither the order, nor any interest therein, nor claim thereunder, shall be assigned or transferred by the Vendor, except as set forth in subparagraph 3B below or as expressly authorized in writing by the STATE PURCHASING AGENTS OFFICE. No such assignment or transfer shall relieve the Vendor from the obligations and liabilities under this order.
   B: Vendor agrees that any and all claims for overcharge resulting from antitrust violations which are borne by the State as to goods, services, and materials purchased in connection with this bid are hereby assigned to the State.
4. STATE FURNISHED PROPERTY: State furnished property shall be returned to the state upon request in the same condition as received except for ordinary wear, tear, and modifications ordered hereunder.
5. DISCOUNTS: Prompt payment discounts will not be considered in computing the low bid. Discounts for payment within 20 days will be considered after the award of the contract. Discounted time will be computed from the date of receipt of the merchandise or invoice, whichever is later.
6. INSPECTION: Final inspection and acceptance will be made at the destination. Supplies rejected at the destination for non-conformance with specifications shall be removed, at the Vendors risk and expense, promptly after notice of rejection.
7. INSPECTION OF PLANT: The State Purchasing Agent may inspect, at any reasonable time, the part of the contractors, or any subcontractor's plant or place of business, which is related to the performance of this contract.
8. COMMERCIAL WARRANTY: The Vendor agrees that the supplies or services furnished under this order shall be covered by the most favorable commercial warranties the Vendor gives to any customer for such supplies or services, and that the rights and remedies provided herein shall extend to the State and are in addition to and do not limit any rights afforded to the State by any other cause of this order. Vendor agrees not to disclaim warranties of fitness for a particular purpose or merchantability.
9. TAXES: The unit price shall exclude all State taxes.
10. PACKING, SHIPPING AND INVOICING:
    A: The States purchase document number and the Vendors name, users name and location shall be shown on each packing and delivery ticket, package, bill of lading and other correspondence in connection with the shipment. The users count will be accepted by the Vendor as final and conclusive on all shipments not accompanied by a packing ticket.
    B: The Vendors invoice shall be submitted in triplicate, duly certified and shall contain the following information: order number, description of supplies or services, quantities, unit prices and extended totals. Separate invoices shall be rendered for each and every complete shipment.
    C: Invoices must be submitted to the using agency and NOT THE STATE PURCHASING AGENT.
11. DEFAULT: The State reserves the right to cancel all or any part of this order without cost to the State, if the Vendor fails to meet the provisions of this order and, except as otherwise provided herein, to hold the Vendor liable for any excess cost occasioned by the State due to the Vendors default. The Vendor shall not be liable for any excess costs if failure to perform the order arises out of causes beyond the control and without the fault or negligence of the Vendor, such causes include, but are not restricted to, acts of God or of the public enemy, acts of the State or of the Federal Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargos, unusually severe weather and defaults of subcontractors due to any of the above, unless the State shall determine that the supplies or services to be furnished by the subcontractor where obtainable from other sources in sufficient time to permit the Vendor to meet the required delivery scheduled. The rights and remedies of the State provided in this paragraph shall not be exclusive and are in addition to any other rights now being provided by law or under this order.
12. NON-COLLUSION: In signing this bid, the Vendor certifies he/she has not, either directly or indirectly, entered into action in restraint of free competitive bidding in connection with this proposal submitted to the State Purchasing Agent.
13. NON-DISCRIMINATION: Vendors doing business with the State of New Mexico must be in compliance with the Federal Civil Rights Act of 1964 and Title VII of that Act, Rev., 1979.
14. THE PROCUREMENT CODE: Sections 13-1-28 through 13-1-199 NMSA 1978 imposes civil and criminal penalties for its violation. In addition, the New Mexico criminal statutes impose felony penalties for bribes, gratuities and kickbacks.
15. All bid items are to be NEW and most current production, unless otherwise specified.
16. PAYMENT FOR PURCHASES: Except as otherwise agreed to: late payment charges may be assessed against the user state agency in the amount and under the conditions set forth in section 13-1-158 NMSA 1978.
17. WORKERS COMPENSATION: The Contractor agrees to comply with state laws and rules pertaining to workers compensation benefits for its employees. If the Contractor fails to comply with Workers Compensation Act and applicable rules when required to do so, this (Agreement) may be terminated by the contracting agency.
18. GENERAL SERVICES STATEWIDE PRICE AGREEMENT: Any purchase order entered into pursuant to a Statewide Price Agreement incorporates by this language all the terms and conditions of that Statewide Price Agreement and by accepting payment under this purchase order the Contractor agrees to and accepts all the terms and conditions of the Statewide Price Agreement.

Exhibit 23

Standard Form 1034
Revised October 1987
Department of the Treasury
1 TFM 4-2000
1034-121

PUBLIC VOUCHER FOR PURCHASES AND SERVICES OTHER THAN PERSONAL

VOUCHER NO. **30150-1**

U.S.DEPARTMENT, BUREAU, OR ESTABLISHMENT AND LOCATION

New Mexico Office of Natural Resources Trustee (NM
121 Tijeras Avenue, NE
Suite 1000
Albuquerque, NM. 87102

DATE VOUCHER PREPARED: **25-JAN-23**

SCHEDULE NO.

CONTRACT NUMBER AND DATE: **2266801000005**

REQUISITION NUMBER AND DATE: **Email authorization dated 10/6**

PAID BY

PAYEE'S NAME AND ADDRESS

Abt Associates Inc.
PO Box 84-5586
Boston,MA 02284-5586

Tax ID# 04-2347643

Electronic Payment Information:
Citizens Bank
ACH ABA: 211070175
Wire ABA: 011500120
Account#: 1107800487

DUNS NO. 05-8595539
UEI NO. C9S1NLQ67626

DATE INVOICE RECEIVED

DISCOUNT TERMS

PAYEE'S ACCOUNT NUMBER

Shipped From To WEIGHT

GOVERMENT B/L NUMBER

NUMBER AND DATE OF ORDER	DATE OF DELIVERY OR SERVICE	ARTICLES OR SERVICES (Enter description, item number of contract or Federal supply schedule, and other information deemed necessary)	QUAN-TITY	UNIT PRICE		AMOUNT
	06-OCT-22 **30-DEC-22**	**For Services Rendered per Contract Agreement** **Amount Claimed Transferred From SF 1035 Continuation Sheet**				**18,386.50**

Digitally signed by Stefanie Umbarger
Date: 2023.01.25 17:34:41 -05'00'

Stefanie Umbarger, Manager Billing Services
Fax 617 218-4501 Tel 617 520-2994
email stefanie_umbarger@abtassoc.com

(Payee must NOT use the space below)

(Use continuation sheets if necessary) **TOTAL** **18,386.50**

PAYMENT:
- ☐ PROVISIONAL
- ☐ COMPLETE
- ☐ PARTIAL
- ☐ FINAL
- ☐ PROGRESS
- ☐ ADVANCE

APPROVED FOR =$

EXCHANGE RATE =$1.00

DIFFERENCES

BY

TITLE

Amount verified; correct for

(Signature or initials)

Pursuant to authority vested in me, I certify that this voucher is correct and proper for payment.

(Date) *(Authorized Certifying Officer)* *(Title)*

ACCOUNTING CLASSIFICATION

PAID BY

CHECK NUMBER	ON ACCOUNT OF U.S. TREASURY	CHECK NUMBER	ON *(Name of bank)*
CASH $	DATE	PAYEE	

1 When stated in foreign currency, insert name of currency.
2 If the ability to certify and authority to approve are combined in one person, one signature is necessary; otherwise the approving officer will sign in the space provided, over his official title.
3 When a voucher is receipted in the name of the company or corporation, the name of the person writing the company or corporate name, as well as the capacity in which he signs, must appear. For example: "John Doe Company, per John Smith, Secretary" or "Treasurer", as the case may be.

PER

TITLE

Previous edition usable.

PRIVACY ACT STATEMENT

The information requested on this form is required under the provisions of 31 U.S.C. 82b and 82c, for the purpose of disbursing Federal money. The information requested is to identify the particular creditor and the amounts to be paid. Failure to furnish this information will hinder discharge of the payment obligation.

STANDARD FORM 1035 September 1973 4 Treasury FRM -2000 1035-110	PUBLIC VOUCHER FOR PURCHASES AND SERVICES OTHER THAN PERSONAL **SUMMARY**	VOUCHER NO. **30150-1**
		SCHEDULE NO.
		SHEET NO.

US DEPARTMENT, BUREAU OR ESTABLISHMENT
New Mexico Office of Natural Resources Trustee (NM

Abt Associates Inc.
PO Box 84-5586
Boston, MA 02284-5586

CONTRACT NUMBER
2266801000005

Percent Expended:	**84.18%**
Funded Cost :	**21,842.00**
Funded Fee :	**0.00**
Funded Total :	**21,842.00**

Analysis of Claimed Current and Cumulative Costs and fee for Period: 06-OCT-22 To 30-DEC-22

MAJOR COST ELEMENTS		RATE	CURRENT HOURS	CURRENT AMOUNT	CUMULATIVE HOURS	CUMULATIVE AMOUNT
Barboa, Juanita Ellen	Administrative -Other	**128.00**	6.00	768.00	6.00	768.00
Forth, Heather P	Project manager	**192.00**	46.50	8,928.00	46.50	8,928.00
Gary, Demi Marie	Mid - Level Staff	**129.00**	10.00	1,290.00	10.00	1,290.00
McFadden, Andrew	Mid - Level Staff	**129.00**	7.00	903.00	7.00	903.00
McLaughlin, Molly Cook	Mid - Level Staff	**129.00**	31.00	3,999.00	31.00	3,999.00
Miles, Erin F	Administrative -Other	**128.00**	4.25	544.00	4.25	544.00
Pierre, Alain D	Admininstrative - Other	**128.00**	1.50	192.00	1.50	192.00
Ritter, Kaylene	Program Manager	**235.00**	2.50	587.50	2.50	587.50
Travers, Constance L (Connie)	Program Manager	**235.00**	5.00	1,175.00	5.00	1,175.00
Total Direct Labor			**113.75**	**18,386.50**	**113.75**	**18,386.50**
Total Amount Due			**113.75**	**18,386.50**	**113.75**	**18,386.50**

Monthly Progress Report
State of New Mexico Office of Natural Resources Trustee
Professional Services Contract #2266801000005
Task Order 9: Cannon Air Force Base
Abt Associates

Period: 06 October 2022 – 30 December 2022

Tasks accomplished/ongoing:

- Prepared the draft Cannon AFB preassessment screen (PAS) report

Notes: None.

Staff	Hours	Activities
Barboa, Juanita Ellen	6.0	Copy edited the draft Cannon PAS report
Forth, Heather P	46.5	General project management – oversight of PAS tasks Prepared the draft PAS report
Gary, Demi Marie	10.0	Assisted with preparing the PAS - Prepared site information sections
McFadden, Andrew	7.0	Assisted with extracting data and preparing
McLaughlin, Molly Cook	31.0	Assisted with preparing the PAS report – Prepared descriptions of the source areas at the site, summarized site data, etc.
Miles, Erin F	4.25	Formatted draft PAS report
Pierre, Alain D	1.5	Administrative Support
Ritter, Kaylene	2.5	Reviewed the draft PAS report
Travers, Constance L (Connie)	5.0	Assisted with interpreting site information and data
Total Hours	113.75	

From: ~~Ebute, Mercy, ONRT~~
To: ~~Girard, Kate, ONRT~~
Cc: ~~Hartstebbins, Maggie, ONRT~~
Subject: RE: AFFF MDL - CERCLA Cost Package
Date: Monday, August 19, 2024 10:21:59 AM
Attachments: ~~image002.png~~
~~image004.png~~
~~image005.png~~
~~image006.png~~
~~image007.png~~

Hello Maggie and Kate,

ONRT report shows these invoices have been paid. Please find below. Please let me know if you would like me to reply Abt Associates on this.

View All

Business Unit	Voucher ID	Invoice Number	Gross Invoice Amount	Payment Amount	Invoice Date	Short Supplier Name	Supplier ID	Supplier Name	Voucher Style	Related Voucher	Entry Status	Voucher Source	Incomplete Voucher
66800	2283	30150-TO9-9	3,503.78	3,503.78	3/1/2024	ABT ASSOCI-001	135650	ABT ASSOCIATES INC	Regular	(blank)	Postable	Online	Complete
66800	2305	30150-TO9-8	509.06	509.06	1/26/2024	ABT ASSOCI-001	135650	ABT ASSOCIATES INC	Regular	(blank)	Postable	Online	Complete
66800	2269	30150-TO9-7	1,959.31	1,959.31	1/8/2024	ABT ASSOCI-001	135650	ABT ASSOCIATES INC	Regular	(blank)	Postable	Online	Complete
66800	2259	30150-TO9-6	712.21	712.21	11/21/2023	ABT ASSOCI-001	135650	ABT ASSOCIATES INC	Regular	(blank)	Postable	Online	Complete
66800	2272	30150-TO9-5	2,935.74	2,935.74	9/18/2023	ABT ASSOCI-001	135650	ABT ASSOCIATES INC	Regular	(blank)	Postable	Online	Complete
66800	2202	30150-TO9-4	18,000.68	18,000.68	7/14/2023	ABT ASSOCI-001	135650	ABT ASSOCIATES INC	Regular	(blank)	Postable	Online	Complete
66800	2170	30150-TO9-3	5,372.75	5,372.75	6/14/2023	ABT ASSOCI-001	135650	ABT ASSOCIATES INC	Regular	(blank)	Postable	Online	Complete
66800	2345	30150-TO9-10	415.92	415.92	7/12/2024	ABT ASSOCI-001	135650	ABT ASSOCIATES INC	Regular	(blank)	Postable	Online	Complete
66800	2120	30150-2	475.00	475.00	2/13/2023	ABT ASSOCI-001	135650	ABT ASSOCIATES INC	Regular	(blank)	Postable	Online	Complete
66800	2091	30150-1	18,386.50	18,386.50	1/25/2023	ABT ASSOCI-001	135650	ABT ASSOCIATES INC	Regular	(blank)	Postable	Online	Complete

Thank you,

Mercy Ebute
Financial Manager
NM Office of the Natural Resources Trustee
(505) 699-5083
121 Tijeras Ave NE, Suite 1000
Albuquerque, NM 87102
www.onrt.state.nm.us

From: Girard, Kate, ONRT <Kate.Girard@onrt.nm.gov>
Sent: Monday, August 19, 2024 6:06 AM
To: Ebute, Mercy, ONRT <mercy.ebute@onrt.nm.gov>
Subject: Fwd: AFFF MDL - CERCLA Cost Package

Good morning, Mercy - What Maggie needs for this is evidence that ONRT paid the attached invoices. We can discuss this morning!

Kate Girard
Executive Director
NM Office of the Natural Resources Trustee
(505) 313-1837
121 Tijeras Ave NE, Suite 1000
Albuquerque, NM 87102
www.onrt.state.nm.us

From: Girard, Kate, ONRT
Sent: Tuesday, August 13, 2024 12:13:33 PM
To: Hartstebbins, Maggie, ONRT <Maggie.Hartstebbins@onrt.nm.gov>
Subject: AFFF MDL - CERCLA Cost Package

From: Hartstebbins, Maggie, ONRT <Maggie.Hartstebbins@onrt.nm.gov>

Exhibit 24

Preassessment Screen Determination for the Cannon Air Force Base

Cannon Air Force Base; photo source: https://www.airplanes-online.com/cannon-air-force-base.htm

Submitted to:

New Mexico Office of Natural Resources Trustee
121 Tijeras Avenue, NE
Suite 1000
Albuquerque, NM 87102
Attn: Maggie Hart Stebbins

Submitted by:

Heather Forth, PhD
Molly McLaughlin, PhD
Abt Global

&

Kaylene Ritter, PhD
Natural Nexus LLC

December 12, 2024

Executive Summary

The Cannon Air Force Base (AFB), near the city of Clovis, New Mexico, has been an active AFB since the early 1940s. At the base, aqueous film-forming foam (AFFF) containing per- and polyfluoroalkyl substances (PFAS) was used during base operations as a fire extinguisher. Use of AFFF has resulted in the release of PFAS to the environment. These PFAS releases have included perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA), two PFAS that the U.S. Environmental Protection Agency (EPA) recently listed as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; EPA, 2024a). The PFAS released at Cannon AFB also includes perfluorohexane sulfonic acid (PFHxS), perfluorobutane sulfonic acid (PFBS), and perfluorononanoic acid (PFNA), which together with PFOS and PFOA, are five of the six PFAS with final drinking water maximum contaminant levels (MCLs) recently published by EPA (EPA, 2024b).

When hazardous substances harm (or "injure") natural resources that are held in trust for the public, federal and state laws provide mechanisms for natural resource Trustees to seek compensation from potentially responsible parties for those injuries on behalf of the public. Regulations outlining a process for conducting a Natural Resource Damage Assessment (NRDA) have been promulgated by the U.S. Department of the Interior (DOI) at 43 CFR Part 11. The New Mexico Office of Natural Resources Trustee, the designated Trustee for the State of New Mexico, has conducted this preassessment screen (PAS) to determine whether to proceed with an NRDA for Cannon AFB. This PAS focuses on the release of PFAS at Cannon AFB (the Site); although other hazardous substances have also been released at the Site.

The purpose of a PAS is to review readily available data to ensure that there is "a reasonable probability of making a successful claim before monies and efforts are expended in carrying out an assessment" [43 CFR § 11.23(b)]. There are five criteria used to determine whether to proceed with an assessment [43 CFR § 11.23(e)], which the New Mexico Trustee evaluated in this PAS:

A discharge of oil or a release of a hazardous substance has occurred

The Trustee has reviewed available data, reports, and literature for Cannon AFB, and confirmed evidence of releases of PFAS. Through use of AFFF during base activities such as fire training activities and emergency response actions, and through stormwater and wastewater management practices PFOS, PFOA, and other PFAS have been released at the Site.

Natural resources for which the federal or state agency or Indian Tribe may assert trusteeship under Comprehensive Environmental Response, Compensation, and Liability Act have been or are likely to have been adversely affected by the discharge or release

Based on a review of readily available data and information, the Trustee has concluded that natural resources for which the state asserts trusteeship have been adversely affected by the releases of PFAS from Cannon AFB. An analysis of soil, groundwater, surface water and sediment dataindicates that these resources have been exposed to, and adversely affected by, elevated concentrations of PFOS, PFOA, and other PFAS. For example, elevated concentrations of PFAS have been measured in the Ogallala Aquifer, the sole source aquifer in the region, at levels above screening levels and standards. Further, biological resources in the area that may ingest or come into contact with soil, surface water, and sediment may also be adversely affected by the releases. The released hazardous substances have potentially impacted a number of

services, including ecological services, human use services such as water use, and passive (nonuse) services, such as existence and bequest values.

The quantity and concentration of the released hazardous substance is sufficient to potentially cause injury, as that term is used in this part, to those natural resources

The Trustee has reviewed readily available data and confirmed that the quantity and concentration of PFAS in groundwater is sufficient to potentially cause injury. For example, concentrations of PFOS, PFOA, and other PFAS in groundwater at the AFB exceed state screening levels and EPA's drinking water MCLs, with the highest PFOS concentrations measured at the AFB exceeding the state threshold by up to several hundred times, and EPA's MCL by over six thousand times. Further, PFAS associated with AFB releases is detected up to 4 miles downgradient source areas on the base. In addition, PFAS concentrations in soils from the Site exceed federal and state soil screening levels for the protection of groundwater and surface water, and human health.

Data sufficient to pursue an assessment are readily available or likely to be obtained at reasonable cost

The Trustee has reviewed available sources of data and determined that an assessment can be conducted and any additional data can be obtained at a reasonable cost. Along with the readily available data reviewed for this PAS, the Site is currently undergoing several investigations by federal and state agencies to further characterize and address PFAS contamination at the Site. The Trustee has determined that the existing data, combined with the results of the ongoing investigations will be sufficient to pursue an assessment.

Response actions, if any, carried out or planned, do not or will not sufficiently remedy the injury to natural resources without further action

The AFB is installing two pump and treat pilot systems at the Site to extract groundwater, treat, and then re-inject it. However, these actions only address groundwater, and their efficacy is yet to be determined (AFCEC, 2024). Furthermore, additional rehabilitation, restoration, or replacement of natural resources both on-site and off-site are needed to compensate the public for interim losses of natural resources within the trusteeship of the state.

In summary, based on the five criteria set forth in the DOI regulations [43 CFR § 11.23(e)], the New Mexico Trustee has determined that an assessment of natural resource damages is warranted.

1. Introduction

The Cannon Air Force Base (AFB; also referred to herein as the base or the Site) is located approximately 7 miles west of the city of Clovis, in eastern New Mexico, and covers an area of 3,789 acres (Figure 1). During operations at Cannon AFB, aqueous film-forming foams (AFFF) that contain per- and polyfluoroalkyl substances (PFAS) were used as a fire extinguisher during fire training exercises and other activities. Recent site characterization activities have shown that PFAS were released at the Site and have contaminated natural resources including groundwater in the Ogallala Aquifer, which is the sole source aquifer in the region, supplying drinking water to the AFB itself, the nearby city of Clovis and surrounding counties, and local agriculture. Elevated levels of PFAS have also been measured in surface soils at the Site.

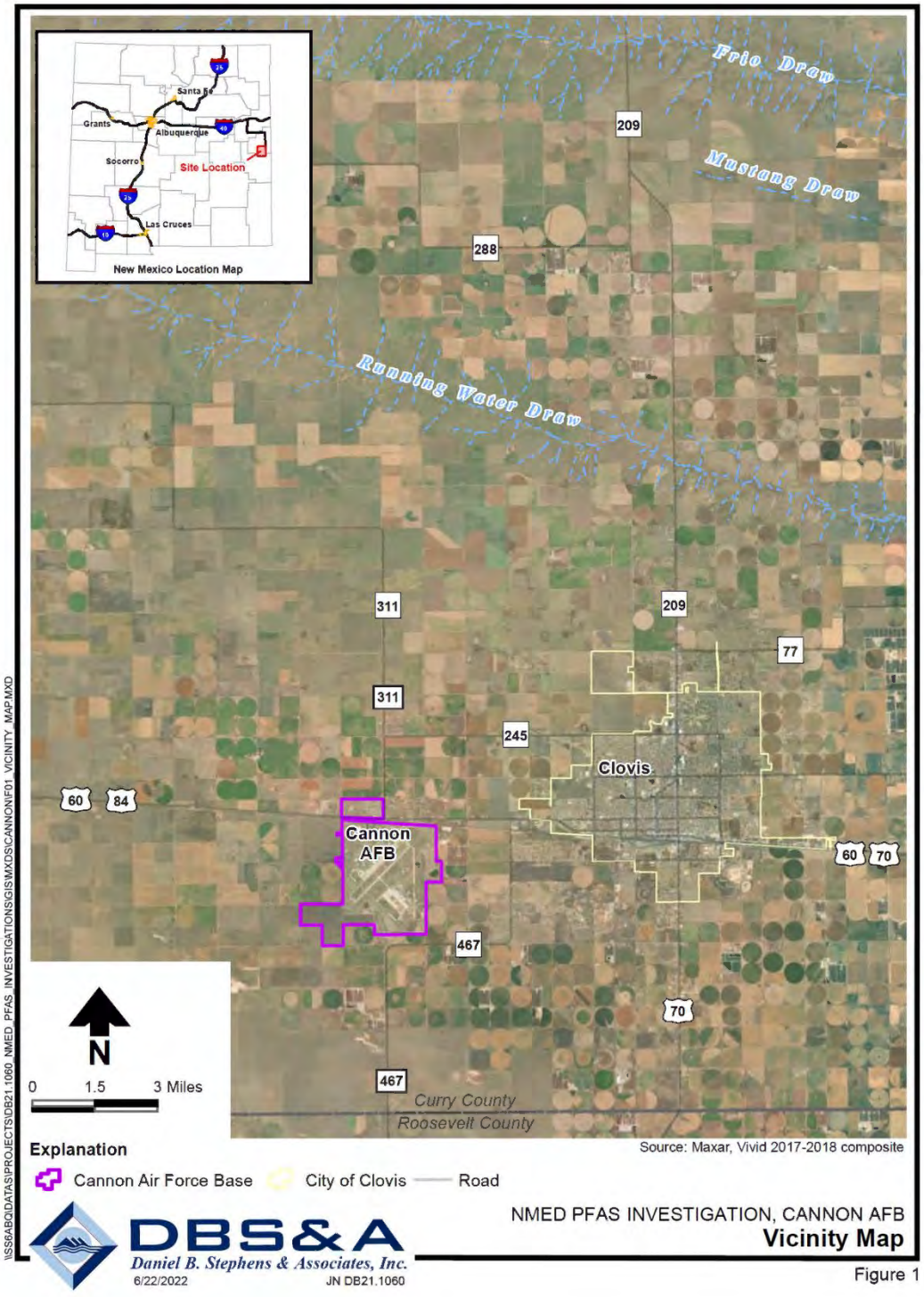
PFAS are a group of man-made chemicals that are composed of a partially or fully fluorinated carbon chain that are generally characterized as being resistant to degradation by acids, bases, heat, or oxidants (Field et al., 2017). PFAS are extremely persistent in the environment, and this persistence means they can accumulate over time in environmental media such as water, soil, sediment, as well as in plant and animal tissue, including the human body. The U.S. Environmental Protection Agency (EPA) recently released a final rule to designate two PFAS, perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA), as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; EPA, 2022a, 2024a). EPA also recently published final maximum contaminant levels (MCLs) for six PFAS in drinking water (EPA, 2024b). Along with these regulatory actions, there is growing evidence that many other PFAS commonly found in AFFF can cause adverse human health effects (ATSDR, 2021).

PFAS were first detected in groundwater and drinking water in samples from the Cannon AFB water supply system collected in 2016 (DBS&A, 2022). Subsequent sampling has identified very high PFAS contamination in groundwater on-site, extending off-site, and impacting groundwater, drinking water, and agricultural operations downgradient of the Site (DBS&A, 2022). Off-site at a dairy operation in the Clovis area, PFAS have been detected in agricultural irrigation wells and in dairy milk and cows themselves (Schaap, 2021; DBS&A, 2022). Over 3,000 cows from the Highland Dairy farm had to be euthanized due to unsafe levels of PFAS and the fourth-generation farmer lost $5.9 million dollars in revenue and had to dispose of the carcasses, with oversight and support from the State of New Mexico Environment Department (State of New Mexico Environment Department, 2021; Davis, 2022).

When hazardous substances harm (or “injure”) natural resources, federal and state laws provide mechanisms that authorize natural resource trustees to seek compensation from potentially responsible parties for those injuries. Regulations outlining a process for conducting a Natural Resource Damage Assessment (NRDA) for the release of hazardous substances have been promulgated by the U.S. Department of the Interior (DOI) at 43 CFR Part 11. A Preassessment Screen (PAS) is the first step in this NRDA process. The purpose of a PAS is to provide a review of available information focusing on resources for which a federal or state agency can assert trusteeship, to ensure that there is “a reasonable probability of making a successful claim before monies and efforts are expended in carrying out an assessment” [43 CFR § 11.23(b)]. The PAS completed for the Cannon AFB presented in this report was prepared using existing data, consistent with DOI regulations, to evaluate whether to proceed with a NRDA claim.

The New Mexico Office of Natural Resources Trustee (ONRT) is the designated Trustee for the State of New Mexico. ONRT is currently evaluating whether to proceed with an NRDA for the Site. This PAS is the first step in the NRDA process based on the DOI regulations.

Figure 1. Location of Cannon AFB.



Source: Figure 1, DBS&A, 2022.

1.1 Intent of the PAS

Subpart B of the DOI regulations provide guidelines for conducting a PAS. The purpose of a PAS is to provide a review of available information focusing on resources for which a federal, state, or Tribal agency can assert trusteeship, to ensure that there is "a reasonable probability of making a successful claim before monies and efforts are expended in carrying out an assessment" [43 CFR § 11.23(b)]. A PAS is not intended to serve as a complete assessment of natural resources injuries, service loss, or damages. This PAS was prepared using existing data, consistent with DOI regulations, to evaluate whether to proceed with the NRDA claim.

1.2 Criteria to be Addressed by the PAS

The content and requirements of a PAS include five criteria used to evaluate whether to proceed with an assessment [43 CFR § 11.23(e)]:

1. A discharge of oil or a release of a hazardous substance has occurred.
2. Natural resources for which the federal or state agency or Indian Tribe may assert trusteeship under CERCLA have been or are likely to have been adversely affected by the discharge or release.
3. The quantity and concentration of the discharged oil or released hazardous substance is sufficient to potentially cause injury, as that term is used in this part, to those natural resources.
4. Data sufficient to pursue an assessment are readily available or likely to be obtained at reasonable cost.
5. Response actions, if any, carried out or planned, do not or will not sufficiently remedy the injury to natural resources without further action.

1.3 Report Structure

The remainder of this report provides the information to satisfy the criteria listed above in Section 1.2, following Subpart B of the DOI regulations:

- Section 2 provides information on the site.
- Section 3 provides the preliminary identification of resources potentially at risk.
- Section 4 provides the PAS criteria determination.
- Section 5 provides the PAS determination.

This is followed by references cited in the text.

- Groundwater use for consumption, irrigation, watering livestock, and other uses
- Use of surrounding land for farming, recreation, or other human activities
- Use, option, and bequest values related to all of the above services
- Other nonuse values, including existence values, related to all of the above services.

For example, the contamination of groundwater with PFAS released from the Cannon AFB has resulted in a reduction in services provided by groundwater for irrigation and livestock watering, and other uses. This preliminary identification should be used to direct further investigations but is not intended to preclude consideration of other resources later found to be affected.

4. PAS Criteria Determination

4.1 Criterion 1 – A Discharge of Oil or a Release of a Hazardous Substance has Occurred

Preliminary site investigations show that releases of PFAS, including the hazardous substances PFOS and PFOA have occurred at the Site (see Section 3.3). Data from these site investigations have documented that elevated concentrations of PFOS, PFOA, and other PFAS in soils, groundwater, and surface water resources have resulted from releases at the Site. Based on the data described in Section 3.3, the Trustee has confirmed that releases of hazardous substances have occurred at the Site.

4.2 Criterion 2 – Natural Resources for Which the Trustee May Assert Trusteeship under CERCLA Have Been or Are Likely to Have Been Adversely Affected by the Release

Existing data indicate that natural resources [as defined in 43 CFR § 11.14(z)] for which New Mexico has trusteeship have been adversely affected by releases of hazardous substances. These natural resources include soil, groundwater, surface water and sediment, and potentially the biological resources that use these resources. The elevated concentrations of PFAS in State of New Mexico soil, groundwater, surface water and sediment, which are in some cases several orders of magnitude above federal and state standards, confirm this finding. As described in Section 4.3, these hazardous substances are present at concentrations sufficient to potentially cause injury.

In addition, hazardous substances have potentially impacted a number of natural resource services, including ecological services (e.g., habitat for biota); human use services such as water use (e.g., for drinking water, agricultural, and other uses); and passive (nonuse) services (e.g., existence and bequest values).

4.3 Criterion 3 – The Quantity and Concentration of the Released Hazardous Substance is Sufficient to Potentially Cause Injury to Natural Resources

The data confirm that the quantity and concentration of the released hazardous substances is sufficient to potentially cause injury to soil, groundwater, and surface water resources.

For example, PFOS concentrations in groundwater at Cannon AFB are up to 25,000 ng/L, which is 415 times above the state's groundwater standard of 60.2 ng/L and over six thousand times EPA's drinking water MCL of 4 ng/L. Off-base, PFOS concentrations as high 15,100 ng/L in the groundwater, which is 250 times higher than NMED's standard of 60.2 ng/L and 3,775 times

higher than EPA's 4 ng/L MCL. PFOA concentrations in groundwater were also above state and federal standards. In soils, PFOS and PFOA concentrations measured at several PFAS source areas at the base are above levels that could potentially cause injury to biological resources and underlying groundwater.

4.4 Criterion 4 – Data Sufficient to Pursue an Assessment Are Readily Available or Are Likely to Be Obtained at Reasonable Cost

The Trustee has reviewed available sources of data and determined that an assessment can be conducted and additional data can be obtained at a reasonable cost. Along with the readily available data reviewed for this PAS, the Site is currently undergoing several investigations to further characterize and address PFAS contamination at the Site. This includes a remedial investigation for PFAS being conducted by the USAF and continued investigations by DBS&A to further define the groundwater plume and characterize PFAS contamination within soils and other resources. To the extent that these investigations do not address data gaps that the Trustee has identified, the Trustee is prepared to obtain the data required in a cost-efficient manner.

4.5 Criterion 5 – Response Actions Carried out or Planned Do Not or Will Not Sufficiently Remedy the Injury to Natural Resources without Further Action

Past remedial activities at the Site where focused on other hazardous substances and did not address natural resource injuries due to the releases of PFAS. Current plans to implement two pump and treat systems at the Site will likely reduce future contamination in groundwater both on and off base, however past injuries of this natural resource have not been addressed, and the Trustee is unaware of any plan to address them. There are also plans to remedy the PFAS contamination in soils near known PFAS source areas, however it is unclear if all areas with PFAS contamination will be sufficiently addressed. The Trustee is not aware of any plans to remedy other natural resource injuries such as surface water and potentially biological resources, or to remedy injuries to natural resources off-site beyond the pump and treat systems that are designed to stop additional PFAS onsite from migrating offsite. The information available at this time suggests the likelihood of injuries to natural resources extend several miles off-site.

5. PAS Determination

Following the review of the information as described in this PAS, ONRT has made the determination that the criteria specified in the DOI regulations have been met. ONRT has further determined that there is a reasonable probability of making a successful claim for damages with respect to natural resources over which the State of New Mexico has trusteeship. Therefore, ONRT has determined that an assessment of natural resource damages is warranted.

References

Air Force Civil Engineer Center (AFCEC). 2018. Swap Complete: AF Protects Airmen, Environment with New Firefighting Foam. Published June 21, 2018. Available: https://www.afcec.af.mil/News/Article-Display/Article/1556282/swap-complete-af-protects-airmen-environment-with-new-firefighting-foam/.

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